QST

amateur radio

The RADIO AMATEUR'S HANDBOOK

we want you to buy a handbook. you need it. for over four y
we've been talking up the handbook and we've sold over 120,
copies of it all over the world. that's because it's good. it sells i
everybody who sees it must have one. through twelve print
constantly revised, it has presented the most modern informa
in the world for radio amateurs. nothing can compare with it.
it is written for amateurs by practical amateurs who know their s
the headquarters staff of the a.r.r.l. the apparatus chapters an
every question. suppose it's receivers you're interested in: here
various band-spreading schemes, a simple two-tube d.c. receive
three-tube a.c. one, a fine four-tube peaked one, a superhet c
verter, or is it transmitters?: a single control low-powered bab
210 hartley, 852's in push-pull, 210's in m.o.p.a., crystal rigs w
sundry doublers, and high-power amplifiers. antennas? all of th
hertz and marconi, end-feed, center-feed, sliding-feed, voltage
current feed. power supply? one for every rig and purse. ra
phone? you bet: world's hottest dope on 100% modulation a
tube combinations, speech amplifiers and modulators for every h
power. whole chapter on keying and trouble shooting. then there
chapters on what amateur radio is all about, how it works, h
radio works . . . explained so you can understand it, too . . . h
to operate, how to handle messages. a complete treatment
operating procedure by famed communications manager han
original handbook author. yes, all of this sounds like a five-do
book. it would be if it were produced in ordinary fashion but
handbook isn't. it's printed "qst" format and gets the 187,654 wo
and 200-odd illustrations of a big textbook down to a price all
afford. no wonder it is the most helpful publication ever m
available for anyone interested in amateur radio. price? a mod
one dollar in heavy red-and-gold paper covers, anywhere in
world. or if you're fussy, stiff buckram binding for two doll
postpaid. as we said at the beginning, you can't get along with
this peerless guide in all amateur activity. order your copy tod
eighth edition.

$1

American Radio Relay Leagu

West Hartford Connecticut, U. S. A

• EDITORIAL •

OUR thoughts this month turn to the ultra-high frequencies. The burden of our song is that, with the amount of commercial development that is now going on with those frequencies, we amateurs had better look to our laurels and get busy on our own account if we are to maintain our reputation as radio pioneers.

Somewhere around 43,000 kc. (7 meters) is a limiting frequency above which "sky waves" seem never to return to earth. Wherever it is, it marks the upper limit of frequencies useful in the ordinary methods of transmission. Although the frequencies up to that value are useful for very-long-distance operation, including at times our "10-meter" band, the frequencies from that point up seem valuable only for quite short ranges. They behave differently, for now it is only the "ground wave" which can be harnessed. Naturally the fields of application are vastly different. They should be just as interesting to us, though, as they are to other branches of radio.

"Quasi-optical," the physicists call these waves. In general they act like light waves. From the meagre literature, one judges that the receiver should be able to "see" the transmitter. If a hill intervenes, the transmission is likely to be cut off. Curvature of the earth limits the range to the distance where the wave becomes tangent to the earth; therefore the higher the transmitter the greater the range. Very limited application? Not at all. This is just the thing for commercial television (if a satisfactory technique is developed), for here is unoccupied territory sufficient to accommodate the enormous modulation bands required and beautifully limited in range, because of the very peculiarities of these frequencies, so that such a use can be duplicated on the same wavelength in every city in the land without interference. We understand that commercial television developments looking to these very ends are in process now. Of course the antenna will have to be on a very high mast, or located on a hill-top, or perhaps even suspended over its "service area" by a small balloon — but those things will work out. Aviation finds these frequencies of even greater promise, and for similar reasons. In Hawaii the public telephone service on the various islands is now interconnected by short-wave radio links on wavelengths of but a few meters, the stations being located on mountain-tops to "see" each other and clear the curvature of the earth in between. The recently-announced "micro-ray" experiments across the English Channel are of similar nature. There loud speech resulted from an input of a half watt on a wavelength of 18 centimeters, a frequency of 1667 megacycles. In such transmission there is no fading, no static, no uncontrollable interference from other stations: radio heaven for short ranges.

Down to perhaps a meter or two, more or less ordinary circuit arrangements can be applied. Below that, in the region of centimenters, a most fascinating world awaits the experimenter with Barkhausen-Kurz oscillations, the oscillations whose frequency is not determined by inductance and capacity but by the orbits which the electrons trace inside the tube, where wavelength is controlled not by tuning but by the varying of voltages. Apparently these oscillations are rather easily produced in appreciable power, for a Japanese laboratorian recently reported transmission over some miles on a wavelength of less than a half meter, the oscillations generated by seven ordinary receiving tubes connected in parallel! These very short waves observe the same laws, apparently, as those of a few meters but of course reduce antennas, reflectors, directors and similar creations to dimensions that are much more comfortably handled. Which reminds us: we wonder how many people know why the amateur assignment at three-quarters of a meter (400 mc.) happened to be at that figure? Years ago Johnny Reinartz, the well-known W1QP, was experimenting with really short waves and found that, as accurately as things could be measured in those days, that was the wavelength for which the copper bowl of the ordinary household electric heater provided an excellent reflector! Doesn't that excite your imagination and cause a few day-dreams, as you visualize reflectors and beam systems in miniature, quickly built, easily changed?

We should find it very interesting to participate in the development of the frequencies above 56 megacycles, particularly in the creation of apparatus that will work well in these regions. It is a rich new field, fertile with possibilities for the ingenious, and undoubtedly destined ultimately to have a big part in amateur radio. Just what that part is, our experimenters will determine.

K. B. W.

In This Issue

IN all the years we have had names, thousands of them, atop *QST*'s articles. They have been more than names to us, of course; they have been individuals, personalities. We at least have known *something* of their past, their present and their probable future. In incoming correspondence at this office we have seen an increasing interest in these Chinns Spitzers and Alphy Blais'. Who are they and why? In this space, from month to month, we hope to tell.

Howard A. Chinn, whose story on the single-control super-het. converter appears in this issue, is one of *QST*'s best known contributors. In response to our request for some authentic information he explains that amateur radio is nothing very new to him — the stations he has owned or had charge of including 2CEG, NU1BAD, W1XM, W1XV, W1XAN and the present W1AXV–W1XP. He continues, "After receiving an B.Sc. and then a M.Sc. from M.I.T., I became associated with the staff of the college as a member of the Round Hill Research Division. At the moment I am concerned with administration details and research at Round Hill where M.I.T. maintains several laboratories in which various problems in the meteorological, aëronautical, physical and the communication field are being investigated. ". . . To-day, my hobby is amateur photography because, after spending the day among all kinds of radio 'gadgets,' there is little incentive to pound brass all evening."

Stuart L. Seaton tells us that he was a simple country lad of fifteen summers when 3BWL went on the air in 1922 with a Sears Roebuck spark coil and a loose coupler. "In 1923," he continues, "a five-watt tube was acquired and from then on the power increased gradually until 1928. At this time, the Potomac Electric Power Co., by whom I was employed, became interested in reaching their field trucks by radio-telephone. For about two years I worked on this problem and at the same time carried on tests with other electric power companies for the purpose of determining what frequencies, powers, etc., should be used to keep the various units of the eastern super-power network in communication with each other for load-dispatching. In the summer of 1929 I was fortunate enough to be chosen by the Department of Terrestrial Magnetism, Carnegie Institution of Washington, to replace Larry Jones (formerly of *QST* staff) as Radio Operator and Observer on the Department's yacht *Carnegie*, which met with such an unhappy end in Apia, British Samoa, in November, 1929. Returning to the United States, I was assigned to the Huancayo, Peru, Observatory, with the task of designing and installing there a high-frequency transmitter and receiver for communication with our Observatory in Watheroo, Western Australia, and with the office in Washington; also the equipment for measurements of the height of the Kennelly-Heaviside layer."

The transmitter mentioned is that detailed by Mr. Seaton in this issue.

Richard S. Briggs, whose article on the pentode as an amplifier in the transmitter gives us so many new thoughts to roll over in our minds, has an interest in radio that was kicked off in 1914. His present call has been his own since 1921. In response to our request for "the dope" he says: "Am a graduate of Electrical Engineering, M.I.T., class '27. While at 'Tech' was a member of the M.I.T. Radio Society and Alpha Sigma Delta Radio Fraternity. During the summer of 1927 I took a short trip as 'sparks' on the United Fruit Boat, *San Pablo*. Have been with the engineering department of the Champion Radio Works, Inc., since June 1928."

Briggs was, during part of 1926–1927, Section Communication Manager of the Eastern Mass. Section, A.R.R.L.

Robert T. Foreman breezes in with a reply to our request for a fact or two — "Thirty years old, red-headed (with the associated temper); a radio widow on my hands. Been invalided for three years by an infected lymph gland, and began radio as a hobby shortly after becoming sick. Secured temporary license in January, 1929; regular amateur license in February of the same year; second-class commercial ticket on trip through Atlanta in June, 1930. Graduate of University of Cincinnati, A.B. 1925. Phi Beta Kappa same year. Majored in Physics. Transmitter here is now a Type '10 crystal tube, another as buffer, with an 03-A and an '04-A following. Traffic handling about biggest work; have handled better than 1600 messages since last January. Net Control Station for Kentucky, Army-Amateur system. No DX to mention but am going to 14,000 kc. for summer and hope to make WAC then."

Ralph William Tanner started in the radio game in 1911. He has owned and operated pre-war RT, 1FCY, 1BZY, 8CMU and W8AD. Even though he is a real "old-timer" he prefers phone to c.w. "A few years ago," he says, "I worked the State of Washington from Ohio on phone with one 202 on 160 meters. That was a real kick." Tanner is off the air temporarily in order to devote all of his time to a television invention.

Strays

The Richmond Short Wave Club, Richmond, Va., has developed into one of the most active organizations in the country. The club program has done much to boost amateur activities in Virginia. A bulletin edited by W3AAJ, Route Manager, is sent to all Virginia stations free of charge. This bulletin contains timely dope on all activities throughout the state. These Virginia fellows will bear watching!

If you hear any strange general calls on the first Saturday night of each month, don't become alarmed. It is only the Route Managers and Section Communications Managers participating in their monthly "QSO Party." Calls "RMNITE," "CQ RM," "CQ SCM," etc., are used and "outsiders" many times answer to ask what it's all about.

The Frankford Radio Club in Pennsylvania is one of the clubs boasting of licensed YL operators. They have two, W3AKB and Mrs. W3MN.

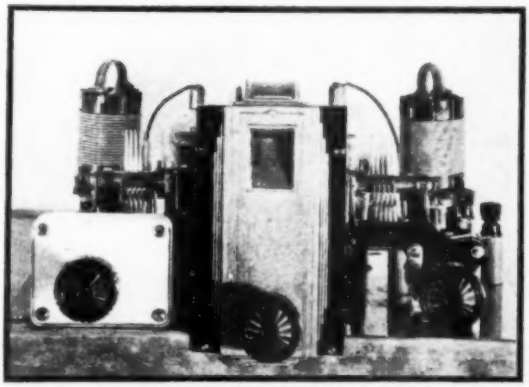
On March 25th at 5:00 p.m. E.S.T. W4AKH at So. Jacksonville, Fla., worked IPH, station of the International Pacific Highway Expedition, and took several messages, all of which were delivered via Air Mail and Western Union. At that time IPH was using a frequency of approximately 14,020 kc. Amateurs are again requested to coöperate in every way possible with this and all other expeditions which work amateurs.

A High-Frequency Converter with Single-Dial Control*

Ganged Tuning for the Short-Wave Superheterodyne

By Howard Allan Chinn, W1AXV-W1XP**

THE manifold advantages to be derived from the use of a modern broadcast receiver as the intermediate frequency amplifier, second detector, and audio amplifier of a superheterodyne system for the reception of high-frequency signals has been appreciated for quite some time,[1] and many "converters" have been designed for this purpose. In most cases, however, the converter introduced certain objectionable operating characteristics that to a great extent counteracted the excellent features of the system. A converter that not only overcomes these difficulties but also which provides simpler tuning control has resulted from careful consideration of the problem.



FRONT VIEW OF THE CONVERTER, SKELETONIZED TO SHOW ITS CONSTRUCTION

The oscillator is to the left and the detector to the right of the drum dial. It is truly single-control in operation, the potentiometer knob at the left and the midget-condenser control at the right being non-essential to tuning over any one band.

Anyone who has had an opportunity to listen to a superheterodyne type short-wave converter used in conjunction with a good broadcast receiver has been immediately impressed with the excellent selectivity of the arrangement. Of course, the selectivity is determined by the characteristics of the broadcast chassis, which, in most modern receivers, provides 10- to 20-kc. band-pass action. Even a fair chassis, however, usually gives a selectivity far greater than that obtained with a short-wave receiver employing both a tuned r.f. stage of amplification and a tuned detector circuit. Another great advantage of this method of reception is that when receiving modulated signals it is possible to obtain very fine tuning by adjustment of the broadcast chassis control. This provides tuning in the high-frequency spectrum that is as easy as tuning in the broadcast band, and a comparison of the ease with which a 14-mc. phone station may be received with this arrangement, and the acrobatics that are necessary with some short-wave receivers to accomplish this, affords a striking example of one of the features of the converter. A good broadcast receiver is usually available, and by simple means it is possible to obtain the necessary filament and plate supply from its power supply unit, thereby providing a completely a.c. operated short-wave superhet receiver at the minimum expense and with the least additional equipment. This receiver is well suited equally for both c.w. and phone reception, although in the former case one of several simple methods to be described will have to be employed to produce an audible beat note in the output of the second detector. Incidentally, the model illustrated is small enough to permit easy transportation, and it is quite a novelty to bring the converter to a friend's home and demonstrate the ease with which foreign broadcast stations, as well as amateur signals, may be received on his own set with quality that is usually as good and sometimes better than that of a relatively near-by broadcast station.

SOME OPERATING FEATURES

The converter is strictly a single-dial receiver. "Yes," some will say, "but there are three knobs plainly visible on the model." True, but the left-hand knob controls the strength of the beat frequency oscillator, and after being once adjusted requires no further attention. This control is made variable merely to provide a simple means of making adjustments that might be occasioned by aging tubes or low plate voltage.

* Contribution from the Round Hill Research Division of the Massachusetts Institute of Technology.

** Round Hill, South Dartmouth, Mass.

[1] "Your Broadcast Receiver as a Short-Wave Superhet," George Grammer, *QST*, July, 1930.

Normally there is no necessity to vary the strength of the beating oscillator and nothing is to be gained by making such an adjustment. The right-hand knob controls the midget condenser which is set at a particular value for each pair of coils and, once adjusted, need not be changed until the coils are changed. The value of this capacity for a given pair of coils is always the same and after the correct value for each of the four pairs of coils has been determined, it is merely necessary to make four appropriate marks on the front panel to permit quick adjustment of this knob to the desired position. Thus the tuning is accomplished entirely by means of one dial and should this be too critical, then fine adjustment is possible by slight manipulation of the tuning of the broadcast receiver.

An important feature of this converter is that the oscillator is coupled to the detector so that even though single control construction were not used, there is practically no reaction of the detector tuning on the oscillator frequency. Interlocking of the controls is one of the most irritating characteristics of almost all "converters" that have been described hitherto, and anyone who has experienced this difficulty will appreciate readily the advantages of the present arrangement.

DESIGN OF TUNED CIRCUITS

The design of single-control superheterodyne receiver tuning circuits must be such that there is a constant difference between the oscillator frequency and the first detector input circuit frequency. In this case this frequency difference must be of such value as to fall within the broadcast band; the coils used with this model were designed for operation with an intermediate frequency of 800 kc. To show the complications that this constant frequency difference requirement causes, Table I has been prepared. In this table there is listed the proposed frequency range of four oscillator coils covering the high-

TABLE I

Oscillator			Detector		
Freq. Range, Kc.		Tuning Ratio	Freq. Range, Kc.		Tuning Ratio
Minimum	Maximum		Minimum	Maximum	
3500	5250	1.5	2700	4450	1.65
5000	7500	1.5	4200	6700	1.60
7000	10,500	1.5	6200	9700	1.56
10,000	15,000	1.5	9200	14,200	1.54

frequency spectrum from 3.5 to 15 mc., with suitable overlapping of the individual ranges. With a given oscillator tuning condenser and with the assumption that the circuit minimum capacitance is alike for all coils, the tuning range (that is the ratio of maximum to minimum frequency) will be constant. In order that the detector tuning circuit may properly track the oscillator, it is necessary that this circuit always be 800 kc. either above or below the oscillator frequency, the latter case being chosen for this

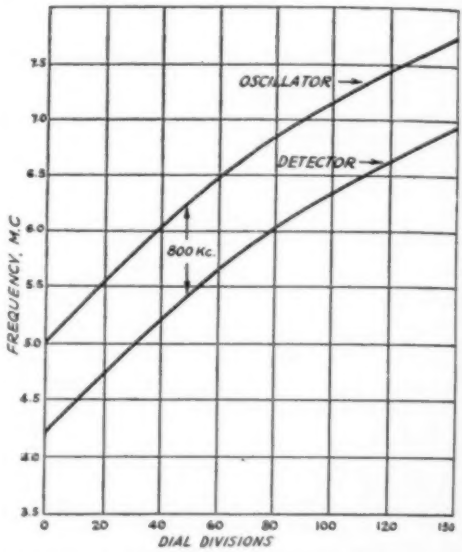


FIG. 1 — SAMPLE CALIBRATION CURVES OF oscillator and detector tuned circuits with the band-determining condenser properly adjusted. These are for coil set No. 2

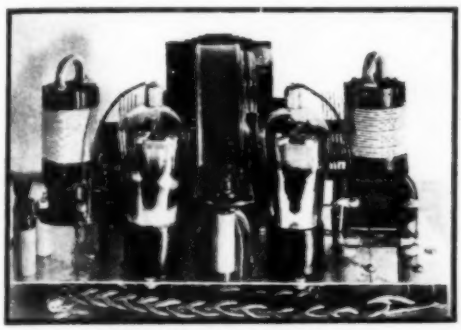
receiver. Consequently, the detector tuning ranges are determined by the oscillator circuit characteristics, and it is immediately seen that the tuning range of the detector circuit is *not* constant for all coils. Obviously, if only one set of coils were to be used, it would be a simple matter to use the proper size variable condenser to obtain the desired range. But in this case four different tuning ranges must be provided; and, of the various methods of accomplishing this, one of the simplest is to provide a means of varying the minimum circuit capacitance and thus vary the tuning range of a given variable condenser. A detector circuit tuning condenser is chosen that is large enough to provide the maximum tuning range required and this is shunted by a midget variable condenser such that when adjusted to its maximum capacitance, the tuning range is reduced to the minimum required. The midget condenser is not, therefore, a trimmer condenser that must be adjusted for each setting of the main tuning control. It has four definite positions: for coil No. 1, it is set at a minimum capacitance, for coil No. 4 at the maximum, and for the other two coils at intermediate positions.

In order to show that the two circuits really do track and provide a constant frequency

difference of 800-kc. calibration, curves were made for each set of coils. Fig. 1 shows the results of these calibrations for one set of coils. It is seen that the two circuits do maintain a constant frequency difference with an accuracy entirely adequate for these purposes.

The actual frequency ranges of the coils constructed for this receiver are given in Table II. This table gives the signal frequencies to which the detector circuit responds for operation at an intermediate frequency of 800 kc. To obtain the actual frequency of the oscillator circuit, it is necessary to add 800 kc. to the figures given.

With the present set of coils, the 3.5-, 7-, and 14-mc. amateur bands are confined to 31, 9 and 14 dial divisions, respectively, the seeming incongruity being caused by the fact that the 7-mc. band falls upon the lower part of the tuning curve where it is steep and the 14-mc. band



AS SEEN FROM THE REAR

Now the detector is at the left and the oscillator at the right. Antenna and ground binding posts are the two at the extreme left, the one mounted on the fixed condenser (C_1) at the center being for the connection to the b.c. receiver's antenna terminal. The grid condenser (C_7) and leak (R_2) for the oscillator are at the right of that tube. The r.f. choke, L_3, is beneath C_3.

(which is also 33% wider) falls on the upper part of the curve where its slope is not so great. Another coil could readily be designed to place the 7-mc. band on a more favorable portion of the curve, but for those who are interested another means of satisfactorily spreading all the amateur bands is available.[2] To do this use is made of the fifth plug on the coil-form base to permit the tuning condensers to be shunted either across the entire coil or across a portion of it. By shunting the condenser across the proper amount of a suitable coil the band may be spread as much as is desirable. All the coils described herein, however, are arranged to have the tuning condenser across the entire coil, the details of connections when the other system is desired being shown in Fig. 2.

[2] "Another 1929 Receiver," P. S. Hendricks, *QST*, May, 1929.

[3] "Detection by Grid Rectification with the High Vacuum Triode," Stuart S. Ballentine, *Proc. I.R.E.*, May, 1928.

One error that is quite common in superheterodyne design is the attempt to utilize grid detection in the first detector circuit. This fallacy is probably brought about by the desire of the designer to obtain as much sensitivity in this part of the system as possible. It has been shown[3] that grid detection under the usual conditions existing in the first detector circuit is quite impossible.

In fact when converting to an intermediate frequency in the broadcast spectrum, as is being done in this case, the detection factor has been shown to be less than a few percent of what it is for low audio frequencies. The possible reason that superheterodynes designed along these lines function at all is because of the amount of plate detection the tube is able to perform even under handicapped conditions. Plate detection with a triode in the usual first detector circuits is relatively insensitive, however, and it was not until the event of the tetrode that this disadvantage could be overcome readily. The four element tubes now available, *when associated with the proper circuit apparatus*, will permit plate detection that is as sensitive as usual triode grid detection.

In Fig. 3, it will be seen that the output of the oscillator is coupled into the detector circuit by means of the voltage drop across a resistor in series with the detector screen-grid lead. This is an adaptation of the so-called screen-grid modulation principle and, for the present purposes, gives excellent results. The use of this method of coupling eliminates almost entirely the reaction of detector tuning on the oscillator frequency. Even if individual control of the tuned circuits were utilized, instead of the single dial method shown, there is no interlocking of controls, provided the oscillator is carefully shielded.

TABLE II

COIL DATA

Coil Set No.	Detector Circuit Frequency Range, kc.	Oscillator			Detector		
		L_3		L_4 Turns	L_2		L_4 Turns
		Turns	Turns per in.		Turns	Turns per in.	
1....	3400–5450	27½	20	16	44	*	16
2....	5000–7750	18	15	13	26	20	13
3....	7350–11,200	12½	10	10	15	15	10
4....	10,600–15,800	7	10	8	9½	10	8

* No. 24 d.c.c. wire, not spaced.

All coils wound on Pilot ribbed coil forms, 1½ inches outside diameter.

All other coils space wound with either No. 20 or No. 22 wire, with or without insulation.

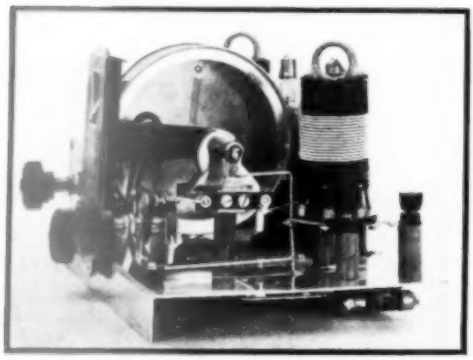
All ticklers wound with No. 32 d.c.c. wire, not spaced.

With the circuit arrangement utilized, it is necessary to provide a strong oscillator if the maximum signal is to be realized. This is accomplished easily by choosing the oscillator grid leak and condenser of such size as to permit the generation of strong oscillations without squealing. Control of the strength of oscillation is obtained by variation of the screen-grid potential. This method recommends itself because the direct current flowing through the potentiometer, when placed in this circuit, is considerably less than if it were used in the plate circuit and, as a result, the useful life of the potentiometer is much greater.

By carefully constructing the oscillator coils, that is, by using just the right number of tickler turns, it would be possible to dispense with an oscillation control entirely, but in this case it would not be convenient to adapt the set to various power supplies, different tubes, and other factors that are likely to be encountered over a long period of operation. If, however, it is desirable to save the expense of the oscillation control it is quite feasible to wind the tickler to the proper size (it is not very critical) and then to compensate for any circuit changes by moving the screen-grid voltage slider on the "B" voltage divider when necessary.

POWER SUPPLY

The advantages of incorporating a "B" voltage divider right in the set, even when a tapped "B" plate supply is available, has been pointed out.[4] This arrangement not only confines



THE DETECTOR TUNING CIRCUIT

Fibre pillars support the tuning condenser, coilsocket and binding-post terminals. The detector cathode resistor is just below the rear of the base. Note the flanged front of the chassis.

all the r.f. paths to the chassis but also simplifies the connection of the converter to the available power supply, only two connections being necessary. The model illustrated operates successfully with a power unit supplying both filament and plate potentials, from power obtained by tapping the broadcast receiver chassis, or from power delivered by a filament heating transformer and "B" batteries. The two tubes require 3.5 amperes at 2.5 volts for filament heating and 150 to 180 volts for plate potential, both of which usually can be obtained from the broadcast chassis. The r.f. and detector tubes in the broadcast receiver are usually the 2.5-volt heater type and an addition of two more tubes probably will not overload the filament winding of the power transformer. Two leads for filament supply should be run from the converter to the terminals on the power pack that supply the filament potential to the broadcast receiver r.f. tubes. This connection should not be made to the chassis itself inasmuch as an excessive filament voltage drop may result because of the additional current being drawn through the 2.5-volt supply cable.

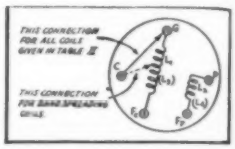


FIG. 2 — Method used to obtain band spreading by tapping-in tuning condenser part way down on detector or oscillator grid coil

A little experimentation with a voltmeter will show the location of the two terminals, providing the necessary high voltage and connection to these affords the plate potential. The total plate current drain is less than 10 ma., so there is very little danger of upsetting the operation of the broadcast set if its power supply is at all adequate. If a wiring diagram of the broadcast receiver is available it is a very simple matter to determine the best place to tap in on the power pack.

MECHANICAL DETAILS

The entire converter is built on 1/16-inch aluminum subpanel measuring 6½ x 11 inches, and it is designed to fit into a 7 x 7 x 12-inch cabinet. The flange bent on the front edge is 1 inch wide and to this is bolted the front panel and also the lower end of the drum dial assembly.

Subpanel tube sockets are used for the oscillator and detector tubes. The coil mountings are standard UY sockets mounted above the subpanel on fibre pillars so that the coils, when in place, are midway between the top of cabinet and the metal subpanel. These sockets are also located a sufficient distance away from the edge of the base so that if a metal cabinet is used the coils will not be objectionably close to the walls. The midget condenser and the potentiometer are both mounted on the subpanel so that the converter can be completely wired and tested before attaching the front panel and placing it in the cabinet. The general arrangement of parts may be seen by inspection of the photographs. It should be noted that on the underside of the base, the numerous by-pass condensers

[4] "Revising Amateur Tuner Design," Robert S. Kruse, *QST*, January, 1931.

are mounted by putting a screw through one end of the condenser and into the metal base, after first making certain that the terminal at the other end of the condenser does not protrude enough to also make contact to the base. Usually the ribs of the condenser are large enough to prevent this, but if the terminals are too long they may be filed or ground down. In spite of the fact that one side of each condenser is electrically connected to the subpanel, they are also wired together. Throughout the wiring of the converter, a wire ground circuit is used and no reliance is made upon circuits through the subpanel, dial, brackets, etc.

In order to save space, the small cartridge resistors are held between pieces of busbar wire with loops in their ends just large enough to receive the tips of the resistors, and when tests show the operation to be satisfactory a drop of solder permanently holds the resistor in place. Where wires pass through the metal subpanel, heavy insulation is advisable to prevent possible short circuits to ground. In this model small primary auto ignition cable was used for this purpose. All battery leads are confined below and all r.f. leads, which were made with bus-bar wire, are above the subpanel.

The coils were wound on ribbed coil forms into which were cut shallow lathe notches. Good coils are very essential for good operation, and under no circumstances should they be wound on a solid spool unless the form is of special material such as the R-29 low-loss bakelite composition.

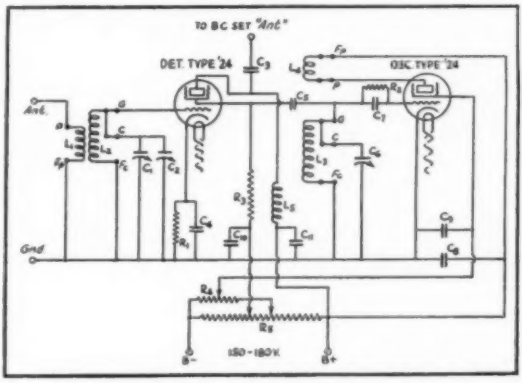


FIG. 3 — SCHEMATIC CIRCUIT OF THE CONVERTER

C_1 — 50-μμfd. condenser, National SE-50
C_2 — 15-μμfd. midget condenser, National STE-15
C_3 — 500-μμfd. Sangamo mica condenser
C_4 — C_9, C_{10}, C_{11} — 0.01-μfd. Sangamo mica condensers
C_5 — 40-μμfd. Sangamo mica condenser
C_6 — 60-μμfd. condenser, National SE-60
C_7 — 100-μμfd. Sangamo mica condenser
R_1 — 5000 ohms, Continental Carbon 2-watt size
R_2 — 100,000 ohms, Continental Carbon 2-watt size
R_3 — 25,000 ohms, Continental Carbon 2-watt size
R_4 — 100,000-ohm potentiometer, Electrad No. 5 Super-Tonatrol
R_5 — 20,000 ohms, Electrad C-200 with 2 extra clips
L_1 — Antenna Coil
L_2 — Detector Grid Coil
L_3 — Oscillator Grid Coil
L_4 — Oscillator Plate Coil — *See Table II*
L_5 — 85-mh choke, Samson No. 85
Dial — National Type HS

Coil terminal letters indicate base connections: F_c is filament terminal nearest cathode; F_p is filament terminal nearest plate

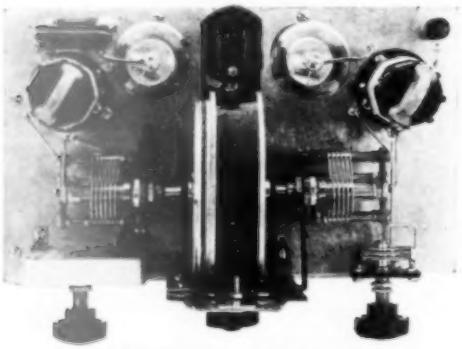
CONNECTION TO BROADCAST SET

If a common ground connection is used on the converter and the broadcast chassis, it only is necessary to transfer the antenna to the converter and then connect the output post of the converter to the antenna post of the broadcast receiver. If either the filament or plate supply, or both, are being obtained from the broadcast set power pack, the ground connection to the converter had best be omitted or made through a series condenser, as in all probability either the "B" minus or the filament supply is already grounded.

To put the set into operation, it is usually advisable to first check the operation of the oscillator. The "B"-plus tap from the oscillator screen-grid potentiometer is set about one-third of the way up from the negative end of the "B" voltage divider. Then by listening in on an oscillating short-wave receiver, a monitor, or heterodyne frequency meter, determine whether the oscillator is operating strongly and smoothly over the entire range of the dial. Do not advance the oscillation control to a point where the tube squeals and emits a lot of mush and other superfluous noises. With the oscillator properly operating and with the broadcast receiver tuned to the desired intermediate frequency, its gain control on full rotation of the converter's tuning dial should result in the reception of signals. For preliminary adjustments, it is convenient to tune to a commercial station that is located at the low-frequency end of the dial (condenser plates entirely enmeshed) and is sending the inevitable endless string of dots (incidentally, these are the result of removing the tape from the automatic transmitter). The midget condenser is now adjusted for the loudest signal. The approximate position of the rotor plates of this condenser for coil No. 1 is all the way out, for coil No. 2 one-third of the way in, for coil No. 3 two-thirds of the way in, and for coil No. 4 all the way in, or at maximum capacity. Make a note of the setting that results in the best signal, then tune to another station at the high-frequency end of the dial and repeat the adjustments. If the midget condenser setting is not the same, then the detector coil is not the correct size to properly track with the oscillator coil. If it is found that more capacity is necessary to properly tune in the second signal (the one at the high-frequency

end), then the detector coil is too big. Conversely, if the midget condenser capacitance must be decreased for the higher frequency signal, then the detector coil is too small. The operation of each set of coils should be checked in this manner, not only at the end of the tuning condenser dial but at several intermediate points. If a continuous range heterodyne frequency meter is available, more thorough checking of the operation and curves, such as those shown in an accompanying figure, may be obtained.

The correct setting of the detector screen-grid voltage can best be determined by tuning in a suitable signal and then varying the position of the slider on the voltage divider. The approximate



PLAN VIEW OF THE ASSEMBLY

The oscillator-first detector coupling condenser, C_6, is mounted vertically between the oscillator tuning condenser (at the left) and the drum dial. The above-panel connections are few and direct.

value of this potential is 20 volts and it is not very critical.[5]

It should be remembered that the oscillation control is not a volume control and an attempt should not be made to use it as such because very poor, if any, success will be had. The volume control on the broadcast receiver is used in the usual manner.

C.W. RECEPTION

There are several ways to heterodyne unmodulated signals so as to create an audible beat tone in the output of the second detector. The simplest method is to tune the intermediate frequency amplifier to a loud local broadcast station. Incoming short-wave signals, after passing through the first detector and being converted to an intermediate frequency, will beat with this broadcast station's carrier and produce an audible signal. In the event that the broadcast station's carrier is not strong enough (and this is often the case because of the extremely loud high-frequency signals that are received), a short antenna may be connected to the broadcast set's antenna binding post. If this still proves unsatisfactory, or if there is no suitable broadcast carrier near the frequency at which it is desired to operate the receiver, or if the modulation on the carrier spoils the reception of c.w. signals, then a local oscillator, tuned to the proper frequency (in this case 800 kc.) may be constructed and placed near the broadcast set. Still another means of receiving unmodulated signals is to use a heterodyne frequency meter, or a monitor, whose fundamental frequency or a harmonic is close to the desired signal. In the case of scheduled operation with a station on a known frequency, this method is very handy, but if the entire band is being explored, it is inconvenient because it adds another control.

If a broadcast receiver with automatic volume control is available, an almost ideal combination results. Until one has had the pleasure of listening to short-wave reception under these conditions, the full benefit of modern receiver design has not been experienced.

TROUBLE HUNTING

It is very essential that the tubes are good. One way to check this is to place each tube to be used in the oscillator and, while listening on another receiver, determine whether they will oscillate. This is a rather unnecessary procedure if the tubes are known to be new and in good condition, but if they are at all doubtful it is advisable to make this test.[6]

The wiring of the input circuit of the broadcast receiver should be examined to ascertain whether it is suitable for coupling to the converter.[7] Sometimes connection of the converter's output directly to the grid of the first r.f. tube gives better results than connection to the antenna binding post.

If it is found that everything works properly except that when the gain control of the broadcast set is varied the signal disappears entirely, reference should be made to the wiring to see that this adjustment does not cause some change in the broadcast receiver's input circuit. In many cases a dual volume control is used, consisting of two potentiometers, one of which varies the screen-grid voltage and the other varies the amount of signal from the antenna reaching the first tube. If the latter is removed from the circuit and the gain varied by adjustment of the screen-grid bias only, no detuning effects will result. The model described has been used with a number of popular broadcast receivers with

[5] "The Operating Characteristics of Vacuum Tube Detectors," H. A. Robinson, *QST*, Sept., 1930.

[6] A visual check for oscillation can be made by connecting a small d.c. milliameter (0–10 ma. or so) in series with one of the "B"-supply leads. Oscillation is indicated when touching the grid terminal of the oscillator causes an abrupt increase in plate current — EDITOR.

[7] A complete detailed wiring diagram of the broadcast receiver may usually be seen at your local radio service store or a copy may be obtained from the factory at a reasonable cost.

excellent results, and it should not be difficult to obtain satisfactory operation in any particular case.

It must be remembered that the selectivity and the gain depend almost entirely upon the broadcast chassis and, unless this receiver is in good condition, proper operation cannot be expected from the system. The converter is equally well adapted to use with tuned r.f. or with superheterodyne broadcast receivers, but in the latter case, unless the oscillator in the broadcast set is well shielded, there is a possibility of many confusing and undesirable beats being generated between the two oscillators, between undesirable signals, etc.; this point cannot be too greatly stressed.[8]

Do not adjust the midget condenser to a point very remote from the probable operating value. In the case of coil set No. 4, for instance, the condenser should be almost all the way in. If the capacity is decreased a very great amount, the detector circuit can be brought into tune with the oscillator since the latter is operating at a frequency 800 kc. higher than the frequency to which the detector should be tuned. Under these conditions, a combination of noises quite indescribable is likely to result.

Last, be certain that the principles involved in the converter are understood. Carefully read the articles that have been referred to in the footnotes and follow the design as closely as possible unless you wish to experiment on your own account.

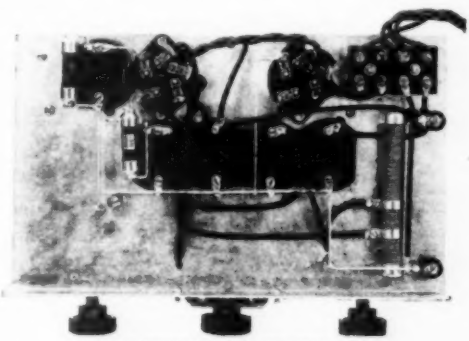
There are no data available concerning the operation of this receiver when constructed of other circuit elements, different coils and the like, so that it will be up to the individual to work out his own salvation if changes are made in the outlined construction.

FURTHER DEVELOPMENTS

Although the converter as described can usually be adapted to any broadcast chassis with little difficulty, the addition of a coupling tube would make successful operation a certainty. It was desired to make the present model as simple as possible and, consequently, this refinement consisting of an impedance matching stage was not incorporated.

The experimenter might also like to try the addition of a stage or two of tuned r.f. amplification in front of the first detector. Little difficulty should be experienced in accomplishing this, but for obvious reasons it might be advisable to change the range-determining condenser to the oscillator circuit under these conditions. Additional tuned circuits in front of the detector will reduce interference caused by the "image" frequency signal (the oscillator frequency minus the intermediate frequency, in this case). Operation of the model described has shown the interference from this cause to be quite small, however, inasmuch as the interfering signal is removed 1600 kc. from the desired signal. If this type of interference should be experienced in some particular case, it is an easy matter to shift the intermediate frequency enough to move the undesired image frequency signal entirely out of the band in which operation is wanted.

[8] Editorial, *QST*, March, 1931.



UNDERNEATH THE CHASSIS

The line-up from left to right checks with the rear view, the detector socket being at the left and the oscillator socket at the right. The principals are the by-pass condensers, voltage divider, terminal block, and resistors R_1 (left) and R_3. The by-pass condensers are, from left to right, C_9, C_{10}, C_{11}, C_8, and C_7.

By incorporating small, properly adjusted trimmer condensers in the detector coils, it would be possible to dispense with the midget band-determining condenser used in this model. The proper minimum circuit capacity to insure the desired tuning range would then be automatically placed in the circuit when the coil was plugged into place.

Strays

In the Mercury-Vapor Ratings article published in March *QST*, the diagrams under Figs. 4 and 6 were inadvertently reversed.

— - - - —

When using 5000-volt mica condensers it is well to bear in mind that this is a *test* voltage and not a working voltage. To be on the safe side the condensers should not be used continuously on d.c. voltages greater than half the test voltage, and if they carry appreciable r.f. in addition to the d.c. the safe working voltage will be even lower.

— - - - —

Ordinary soldering lugs make a good mounting for grid-leak type resistors, either for breadboard work or directly on the grid condenser terminals. Simply bend them at right angles at the small end and fasten down. The resistor fits in the large holes as usual.

— *Harold Schneider, Whitefish, Mont.*

Putting the Pentode to Work

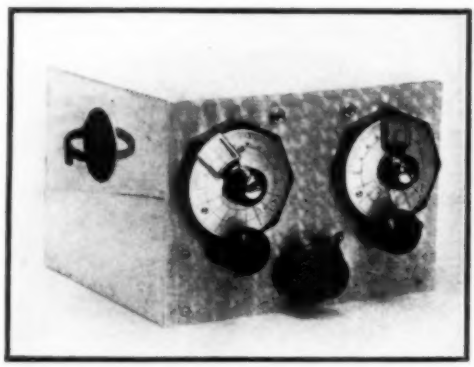
The Construction of a Small Receiver of High Sensitivity

By Ross A. Hull, Associate Editor

Here is an ideal example of a high-frequency receiver in which the incorporation of a pentode audio tube is definitely justifiable. Though the set is unusually small, light, and economical to operate, the pentode gives it the biggest pair of lungs ever. It is a veritable squawk-box.—EDITOR.

AMATEUR radio would be robbed of half its interest if there were not a thousand and one possible variations in the design of station equipment. Imagine how dismal it would be if all our outfits were exactly alike! Think of the pleasurable argument and discussion which would be eliminated if all our sets worked in the very same manner! Fortunately, there are just about as many receiver arrangements as there are amateurs. And though most fellows will uphold their present set through thick and thin, they are usually ready at least to recognize the possible merit of something quite different from their own.

This outfit is just another receiver. At the same time, it differs from the conventional high-frequency receiver of this country in that it contains a pentode as the output amplifier. Then, it produces more "sock" per cubical inch of content than the receivers to which we have been accustomed. The original set was built by the writer just before leaving Australia and used to while away some hours of the five-week sea trip to this country. In the first instance, it was equipped with low consumption European tubes and operated from three dry cells and some lightweight plate batteries. The idea had been to make the set about the size and weight of a camera and as readily transportable—yet to provide it with modern tubes and to tolerate no sacrifice in performance because of the space limitation. It was planned, also, to avoid the necessity for removing shielding in order to change coils, but at the same time to incorporate an effective stage of tuned radio-frequency amplification — one which would have relatively high gain with a practical minimum of interlocking between the two tuned circuits. All of these desirabilities were made possible in the design of the receiver. In its original form, the set was quite successful. On the trip we acquired with it an enormous bag of amateur signals from all parts. From the short-wave broadcasters we could usually obtain a good loud-speaker full, while on the broadcast band (for which we had special coils and external tuning condensers) we were able to hold a half-dozen of the more powerful American stations even when the ship was 6000 miles from them (yes, the O.M. checked the distance for us).



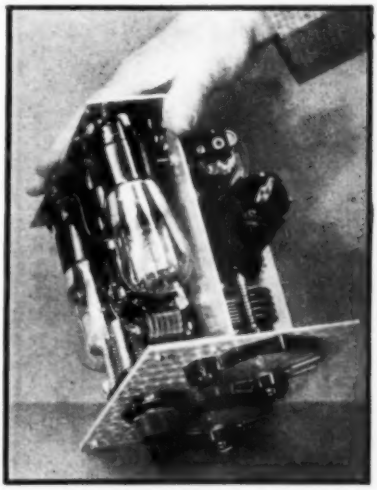
"... ABOUT THE SIZE AND WEIGHT OF A CAMERA AND AS READILY TRANSPORTABLE"

WHY THE PENTODE?

Recently, we turned the set inside-out and modified it to incorporate the American 2-volt screen-grid tubes and one of the new pentodes. We must be guarded in our comparison of these with the tubes originally used if we are to avoid international disruption; but at least we can admit that the performance of the set was not in any way hampered. The tubes used are screen-grid Type '32 for the r.f. amplifier and detector and a Champion '33 Pentode for the audio. The present receiver, operated on the amateur bands, appears to have a greater overall gain than the usual four-tube battery operated set. There are very few signals weak enough to be comfortable in the headphones — a state of affairs which leads us to suggest that the pentode output tube be incorporated only when loud-speaker operation is desired or when an unusually small antenna is to be used. Of course, most of the unusual gain is merely the result of using a pentode. Certainly the pentode far more than compensates

for the small sacrifices in efficiency which may result from so compact an arrangement of the components. And this is the important point to recognize: It is because of the need for a small set, light in weight and easy on batteries, that the pentode was justified in the first place. Without it, this or any other set with a limited number of tubes would be definitely handicapped as far as sensitivity is concerned.

Well, let us drop generalities for the moment and discuss the mechanical lay-out of the receiver. In it we have departed quite a little from the conventional. A plain base-board, with or without panel, is fine for experimental work and for the usual station requirements, as we all know. At best, however, the scheme is somewhat crude. In the case of a set built to occupy the least possible space, it is definitely out. Far too much space is wasted in the "canyons" between tubes, coils and condensers. There was considerable sketching and scribbling before we decided upon the lay-out shown — one in which the three tubes and their associate gadgets are contained in a box measuring 6⅜ by 7 by 5 inches. The arrangement is perhaps not clearly shown in the photographs, but its simplicity is indicated in the sketch of the metal work. We had the various pieces of 1/16-inch aluminum cut to shape and bent in a machine shop. The same work could be duplicated in any well-equipped hardware store or metal supply house. Alternatively, the whole metal skeleton could be built up of flat sections joined with angle pieces. The base in our set is in one piece, bent down at front and back to provide a 2-inch cavity underneath. In this cavity the detector and audio tubes are located. On top of the base there is a partition which, when the cover is in place, divides the upper portion of the set into two compartments. The radio-frequency amplifier tube lives in a hole in the partition with its grid and adjoining the input tuned circuit and its plate end (the base) keeping the other coil company. In this way a more effective isolation of the grid and plate circuits appears to be obtained notwithstanding the existence of a hole in the partition through which the tube passes. The coils of the input and output tuned circuits are mounted on opposite faces of the partition, and the width of the receiver is such that the handles of the coils project conveniently through holes in the sides of the cover. In this way, even though we have a couple of large holes in the shielding, the fields of the two coils are given ample isolation.



A CONGLOMERATION OF GADGETS

A view of the left and underside of the receiver.

This arrangement of the r.f. amplifier and its circuits proves to be most convenient when we turn to the detector and its adjuncts. The detector tube itself is mounted immediately under the output circuit of the r.f. tube upstairs. Its socket is attached to the rear portion of the base and the grid cap faces forward in a position where the grid lead from the tuned circuit can be dropped right onto it. The lead from the plate terminal of the detector up to the reaction coil is equally convenient, as are the connections of the reaction condenser. With the output tube on the opposite side of the receiver, we have a fine spot between them for the apparatus of the detector-audio coupling device.

But it is difficult to provide a useful word description of the thing — and unnecessary in view of the several illustrations. We would remind the beginner who may be interested in building such a set that the lay-out really is important and that radical variations should be made only after careful consideration of the wiring changes which must result. We need not remind the advanced fellow that the same circuit arrangement with any well considered bread-board type lay-out can still work as well. At the same time we might express our private belief that some such compact arrangement can actually benefit the performance because of the happy (even if accidental) way in which the right grid, plate and coil terminals fall together.

THE CIRCUIT

Though it contains seven grids, it will be seen on examination that the circuit shows no radical departure from the standard sort of rig. A tuned input to the r.f. tube; "tuned anode" coupling between r.f. and detector; and resistance coupling from screen-grid detector to audio are the features. L_2, C_1 comprise the input circuit, to which is inductively coupled the antenna coil L_1. The radio-frequency amplifier (a Type '32) is operated, like the other tubes, with one of its filament terminals grounded to the chassis. The input coil is also grounded and the tube, therefore, operates without artificial bias. Experiment with external bias for this tube has shown it unnecessary as far as performance is concerned

and essential only if the plate current must be reduced to the lowest possible value. This bias, should it be considered worth while, could be obtained in the usual manner by inserting a resistor in the negative filament lead (between the filament terminal and ground), but this would call for something higher than a two-volt filament supply. We did not consider it to be justified.

The screen of the r.f. tube is fed from a 45- or 67½-volt tap through the de-coupling resistor R_1. It is by-passed by a condenser C_4 which, like all other fixed condensers in the set, is of the miniature Sangamo type known as "Illini." The Aerovox people, we understand, also have a similarly small type. The condensers measure about 1⅝ by ⅝ inches. In the plate circuit of the r.f. tube we have the usual tuned circuit L_2, C_2. Condenser C_5 is really a part of it, serving, as it does, to isolate the positive plate supply wiring from ground, at the same time completing the r.f. circuit between the bottom end of the coil and ground. The grid leak of the detector is carried to the positive filament terminal in the usual manner.

Regeneration control is accomplished by the usual "throttle" method in preference to variation of the screen voltage chiefly because a good midget variable condenser is much more readily available than a noiseless potentiometer. A by-pass condenser for the detector would be required in any case, and when it serves a dual purpose we have at least eliminated one piece of gear. The detuning accompanying regeneration adjustment is so slight as to be of no consequence.

Coupling to the audio tube grid circuit is obtained with the help of plate resistor R_2 and coupling condenser C_8. The value of R_2 at 100,000 ohms may seem low, but in this case we found it preferable to the higher values when using a supply voltage of the order of 135–150.

The remaining connection of interest is that to the "suppressor" grid of the pentode. The terminal on the tube socket belonging to this grid is the one marked "C." *It is connected not to the plate but to the positive plate supply lead ahead of the phones or speaker.* In this way it is provided with a steady potential.

The first work in building this receiver would be to obtain the necessary metal pieces for the chassis and cover. These, as we have suggested, might well be cut to shape and bent at some metal supply house or well equipped hardware store. Altogether, there are five pieces — the panel; the base; the partition; the cover for top and sides; the filler for the upper rear portion of the cover. The three pieces of the chassis itself are secured with small machine screws and nuts. The two sections of the cover, in our set, were soldered with a special aluminum solder. We accomplished this by setting the two pieces on the gas stove, heating them until they were almost red hot and then applying the solder. We have not experimented with the various special solders available in this country, but it seems highly probable that most of them would be completely satisfactory for a job of this nature, in which no great mechanical strength is necessary.

The holes in the sides of the cover, in the partition and at the rear of the base (for the battery plug) were drilled with a cheap "washer cutter." Used in an ordinary drilling brace, such a cutter will make neat work of the holes if the aluminum is kept "juicy" with some thin machine oil.

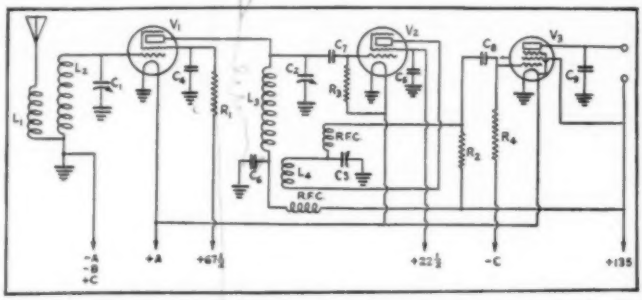


FIG. 1 — THE CIRCUIT SHOWING THE PENTODE CONNECTED FOR LOUD-SPEAKER OPERATION

For headphone work, 67½ volts are used for the pentode plate supply.

V_1, V_2 — Type '32 2-volt screen-grid tubes.
V_3 — Champion Type P-730 pentode. The RCA type number of a similar tube is 233.
C_1, C_2 — Midget variable condensers of capacity determined by band spread required. See text.
C_3 — 100-μμfd. midget variable.
C_4, C_5, C_8, C_9 — .004-μfd. Illini condensers.
C_6 — .002-μfd. Illini fixed condensers.
C_7 — 150-μμfd. Illini fixed condensers.
R_1 — 50,000-ohm carbon type resistor.
R_2 — 100,000-ohm carbon type resistor.
R_3 — 2-megohm gridleak.
R_4 — 1-megohm gridleak.

COIL DATA

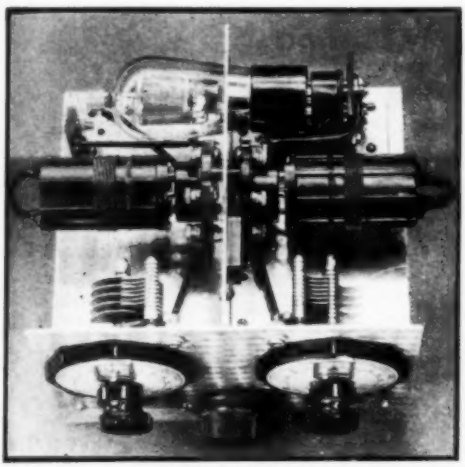
Band	Coil Turns L_1	L_2	L_3	L_4
14,000 kc.	3	8	7	5
7,000 kc.	4	15	14	7
3,500 kc.	7	31	29	11

For these coils, midget tuning condensers cut to 7 plates are used. For high-frequency broadcast reception and general coverage of all the useful high frequencies, 23 plate midgets should be used. The necessary coils then are:

Band	Coil Turns L_1	L_2	L_3	L_4
20,000 to 9,640	2	5	4½	3
9,670 to 4,680	3	11	10	6
4,800 to 2,400	6	21	20	9

These band coverages are, of course, approximate only. No. 22 d.s.c. wire is used for L_2 and L_3 in all cases. L_1 and L_4 are wound with 30 or 32 d.s.c. wire.

Upon the completion of the chassis skeleton, a study of the illustrations might well be made so that the arrangement of the parts may be clearly understood. The first step could be the drilling of the panel for the three midget condensers and the two dials. The dials used in our set are of an English make not available in this country. However, any of the standard small vernier dials



THE SET, WITHOUT ITS COVER, SEEN FROM ABOVE

The input tuned circuit is at the left, convenient to the grid of the r.f. valve. On the right of the central partition is the tuned circuit between the r.f. and detector valves.

could be used in their place. The size of midget condensers used in the two tuned circuits depends on the use to which the receiver is to be put. For operation exclusively on the amateur bands, a capacity of about 50 $\mu\mu$fd. or less would be in order. The 100 $\mu\mu$fd. size would be more suitable when it is necessary to cover most of the high-frequency spectrum for broadcast reception. The rotors of these condensers, and also that of the regeneration control condenser, are grounded to the panel.

The tuning coils, wound on Pilot forms, plug into two Pilot Type 212 sockets mounted on opposite faces of the central partition. Two machine screws, running through the partition and the sockets, serve to hold them in position. The terminals of these sockets are oriented in the manner indicated in Fig. 3. For the horizontal mounting of the r.f. tube, a Pilot Type 214 socket was fitted in a small rectangle of bakelite, this in turn being attached to the base with a small metal angle. The remaining fitting above the base is the small piece of bakelite fitted with a cord tip jack for the antenna connection. Located near the grid cap of the r.f. valve, this is also attached to the base with a small metal angle piece. A hole in the outer cover permits the antenna to be inserted in this socket. The units C_4 and R_1 are mounted immediately under the base end of the r.f. tube.

Beneath the base we have a somewhat more complex array of parts. Pilot Type 216 sockets are used, because of their small size, for the detector and output tubes. A UX type, of course, is used for the detector, a UY type being necessary for the pentode. Occupying a central position at the rear of the base is the fixed section of the battery cable connector. Ours is of foreign make, but it could have been displaced by a Yaxley unit with still greater saving in space. Immediately in front of it is the double set of clips which serve to mount the resistors R_2 and R_4. Soldered in place between these two resistors is the coupling condenser C_3. The two radio-frequency chokes are to be seen in the view of the underside of the base. They are attached to the base with machine screws at points convenient to the leads in which the chokes are inserted. The Silver-Marshall Type 277 would be suitable. The remaining gadgets include the grid condenser and leak (to be seen right at the grid end of the detector tube) and the screen by-pass condenser C_5, located between the detector tube socket and the battery connector. Then, there are the two tip jacks used for the connection of 'phones or speaker. These are mounted on a narrow strip of bakelite with the heads of the sockets projecting through two holes in the rear face of the base.

THEN, THE WIRING

With the particular lay-out shown, the wiring of this set is a very simple matter. There is, in fact, not much more than a couple of feet of wire in the whole thing. We used 20-gauge bare wire encased in empire cloth sleeving but, naturally,

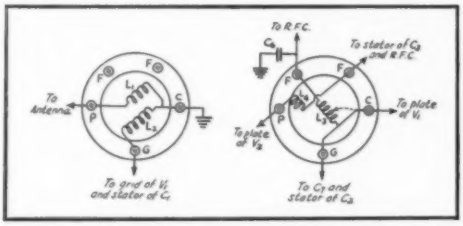


FIG. 3 — CONNECTIONS OF THE COILS AND THEIR SOCKETS

Normally, a jumper runs from the "C" pin of the plate coil to the "G" pin. This connects the plate of the r.f. valve to the top of L_3. On the coil used for 3500-kc. 'phone (and on any other band where extra selectivity may be necessary) the "C" pin is connected to a point along L_3. The nearer is this point to the bottom end of L_3, the greater will be the selectivity and the lower the available amplification.

any other well-insulated wire is equally suitable. The "grounds" indicated in the circuit diagram are all made to machine screws in the metal work.

The winding of coils has been treated so often that it should hardly be necessary to say much in this instance. Pilot coil forms are used because of

the convenient handles fitted to them. A standard spacing of 3/16 inch is used between L_1, L_2, and L_3, L_4. Some variation of the number of turns given will probably be necessary to provide the necessary band coverage. Slight adjustment of the turns of one coil of each pair will often be necessary to permit the two dials to "track." Provision is made in the wiring of the plate coil of the r.f. tube for a plate connection somewhere down the length of L_3. This will often be found desirable in the coil used for 3500-kc. phone reception to give better selectivity. A plate connection at the midpoint of L_3 is suggested for that particular coil. For c.w. reception on this or other bands, however, we have not found any particular advantage to be gained by using less than the total coil turns in the plate circuit. From the appearance of the coil arrangement within the set it would seem that the insertion of coils into their sockets would be an awkward procedure. This is not so, however, providing a mark is made at the edge of the holes in the cover at the location of one of the screws on the coil handle. It is then unnecessary to peer into the compartment in order to locate the grid hole in the socket.

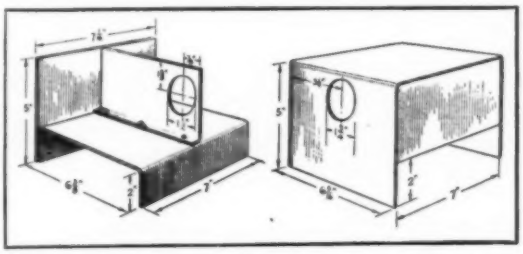
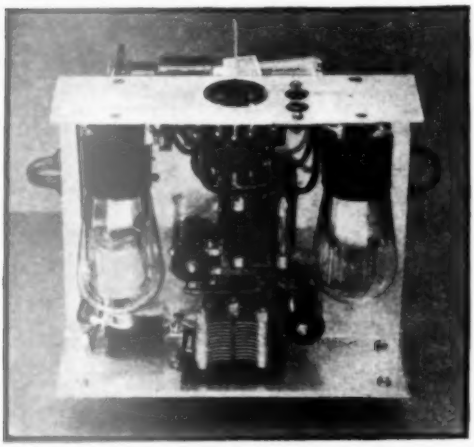


FIG. 2—THE DIMENSIONS AND CONSTRUCTIONAL DETAILS OF THE METAL CHASSIS AND COVER



Showing the detector tube (left) and the pentode with their associated apparatus. The receiver is resting on its panel.

Upon first putting the set into operation it is very probable that adjustment of the number of turns in the reaction coils will have to be made until the set oscillates only towards the maximum setting of the reaction control condenser. Aside from this, it should all be straight shooting. Amateur signals (if the receiver is operating correctly) will be exceedingly loud, and unless a very small antenna is used it is certain that headphone operation will be somewhat uncomfortable. There is an important point to be mentioned in this connection. The plate current of the pentode used (with its rated 135 volts of plate supply and 12-volt control grid bias) is of the order of 19 milliamperes. This, of course, if far too great to be allowed to flow through phones. For phone work, therefore, the tubes should either be biased negatively with about 22½ volts or operated at a lower plate voltage. The latter arrangement is suggested. The 67½-volt tap could be used for the plate and "suppressor" grid of the pentode, with a bias of 9 or 12 volts.

The total filament drain of the set is .38 amperes and this naturally calls for something more than dry cells if it is to be operated for long periods. A single lead-type storage cell is, of course, quite satisfactory. The Eveready "Air Cell" also fills the bill admirably.

Maritime Division Convention

Halifax, N. S., June 19th—20th

THE Maritime Amateur Radio Association cordially invites all amateurs to attend this convention which it is sponsoring at the Lord Nelson Hotel, Halifax, on Friday and Saturday, June 19th and 20th, respectively. A splendid program has been prepared which includes talks, stunts, R. O. T. A. B. initiation, visits to CKA, CHNS, and other interesting points.

The price of $3.00 will admit you to every meeting, trips and banquet.

Further information may be obtained from Mr. G. Arthur, Secretary, 105 Inglis St., Halifax, N. S.

Strays

The "RCA Radiotron Handbook" contains data sheets and families of characteristic curves for the tubes sold through radio dealers. This group includes all receiving tubes (the Type '10 is considered a receiving tube) and also the Type '52 and '66. The subscription price for the set of sheets, including a stiff cover, is $3.50. The price also includes service in keeping the sheets up-to-date for a period of one year. This information has not been available to the general public previously.

A Self-Contained 200-Watt Transmitter

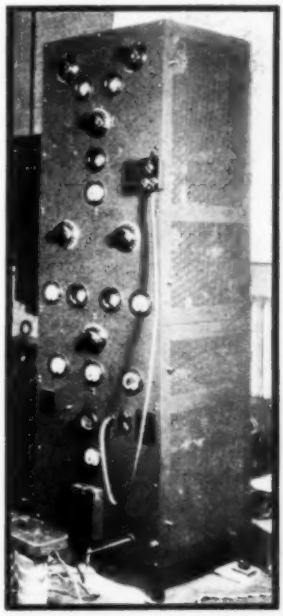
By S. L. Seaton, W3BWL*

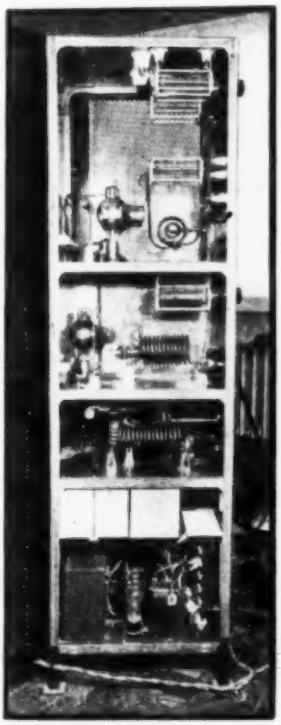
THE transmitter in use at the present time at W3BWL and described in this article was designed for the Huancayo (Peru) Magnetic Observatory of the Department of Terrestrial Magnetism, Carnegie Institution of Washington.

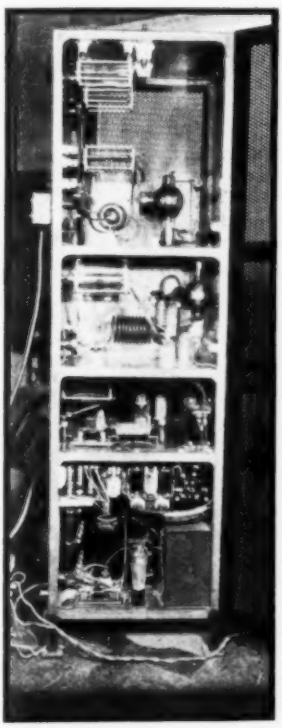
The experience gained from the transmitter on the *Carnegie* showed that frequency-stability is of primary importance and next to frequency-stability, power. The latter depends upon the capacity of the supply system; in the case of the Huancayo Observatory a 9-kilowatt engine-driven generator is planned. Also the ability to change frequency easily was found an important item. In view of the above a crystal-controlled master-oscillator was indicated, this master-oscillator to be followed by amplifiers for frequency-doubling and increasing the power.

*Department of Terrestrial Magnetism, Carnegie Institution of Washington, Washington, D. C.

In the actual transmitter shown in the accompanying photographs it was decided to incorporate the high-voltage power-supply in the same frame as the rest of the equipment in order to make a complete unit. Reviewing the power-requirements it was obvious that 500 volts direct-current was needed for the master-ocillator plate-supply, 300 volts for the "C" bias, and 2000 volts for the plate-supply to the amplifiers. This called for three rectifier-banks with their supply and filter-equipment. A compromise was effected, however, and one 1000-volt rectifier-filter unit is connected to a potentiometer from which is taken the master-oscillator plate-supply and also the "C" bias for the amplifiers. Another 2000-volt unit was installed for the amplifier plate-supply. Because Type '66 rectifier-tubes were to be used, a one-half minute time-relay had to be installed in the high-voltage transformer primaries. For







FRONT AND SIDE VIEWS OF THE 200-WATT TRANSMITTER

The crystal-controlled oscillator is on the second deck and uses a W.E. 50-watt tube. This excites a 75-watt screen-grid tube used as a straight amplifier or doubler and located in the third deck left-side compartment. On the same deck with this stage and to its right is the following straight amplifier or doubler using another 75-watt screen grid Type '60 tube. The top compartment contains the final amplifier, in which two 75-watt Type '60 tubes are used in parallel, and the antenna coupling circuit. The four compartments are shielded from each other by brass partitions, and the sides and back are covered by removable perforated metal screens. The power supply and control equipment is mounted on the bottom deck. Using a 3500-kc. band crystal, output frequencies in any amateur band from 3500 to 28,000 kc. can be obtained by various combinations of straight and frequency-doubling amplification.

this a Telechron clock-motor is used to drive a cam, upon which is fixed a bakelite lobe, operating a series of contacts to give proper control. Referring to the schematic circuit of Fig. 1, it will be seen that the closing of the main-line switch lights the filaments and starts the Telechron relay, which, after one-half minute, closes the master-oscillator and "C" bias transformer-primary circuit and also the keying-relay circuit of the 2000-volt transformer. If the main-line switch is opened or the "off" button pressed, the transformer-primary circuits will be broken and the Telechron relay will return to the starting position. Then to start sending again the "on" button must be pressed. Due to this ingenious scheme,[1] it is impossible to apply high-voltage to the Type '66 rectifier-tubes before they are warmed to the proper operating temperature.

[1] Designed by C. Huff, of the Department of Terrestrial Magnetism.

The lower compartment of the transmitter houses the high-voltage transformers, the rectifier-tubes, filter-chokes, filter-condensers, relays, potentiometer, cooling fan, rectifier-filament transformers, main switches, and filament-rheostat and voltmeter for the radio-frequency tubes. A "close-up" illustrates the placement of the control-delays and the construction of the special time-relay relay.

In the second compartment is the master-oscillator and its meters and tuning-equipment, also the quartz crystal and the filament-transformer for the radio-frequency tubes. There are three radio-frequency chokes in this compartment; they are about 5" long by $1\frac{1}{2}$" in diameter, have six slots $\frac{3}{16}$" wide and about $\frac{1}{2}$" deep, and are wound with No. 22 double-covered cotton wire, all the pancakes being in series. This type of choke completely solves the problem of an effective choke for all frequencies above 1500 kc. The coupling-condensers to the first Type '60 amplifier

1. Antenna condensers, 450-μμfd.
2. Antenna ammeters, 0–3 amp.
3. Antenna inductance.
4. Third stage tank inductance.
5. Third stage tank r.f. ammeter, 0–20 amp.
6. Third stage tank condenser, 450-μμfd.
7. Third stage plate milliammeter, 0–500 ma., d.c.
8. Third stage tubes, Type '60.
9. Third stage screen-grid supply resistors, 100,000 ohms.
10. Third stage by-pass condensers, .01 μfd., 2,500 volts.
11. Third stage negative grid-supply r.f. chokes (see text).
12. Coupling condensers, .002-μfd., 5,000 volt.
13. Second stage tank inductance.
14. Second stage tank r.f. ammeter, 0–15 amp.
15. Second stage tank-condenser, 450-μμfd.
16. Second stage screen-grid supply resistor, 100,000 ohm.
17. Second stage screen-grid by-pass condenser, .01-μfd., 2,500-volt.
18. Second stage tube, Type '69.
19. Second stage filament by-pass condenser, .01-μfd.
20. Second stage negative grid-supply r.f. choke.
21. Second stage coupling-condensers, .002 μfd., 5000-volt.
22. First stage plate milliammeter, 0–500 ma., d.c.
23. First stage tank inductance.
24. By-pass condensers, .01-μfd., 2500-volt.
25. First stage tank r.f. ammeter, 0–15 amp.
26. First stage tank condenser, 450-μμfd.
27. First stage screen-grid supply resistor, 100,000-ohm.
28. First stage screen-grid by-pass condenser, .01-μfd., 2500-volt.
29. First stage filament by-pass condenser, .01-μfd.
30. First stage tube, Type '60.
31. First stage coupling-condensers, .002-μfd., 5000-volt.

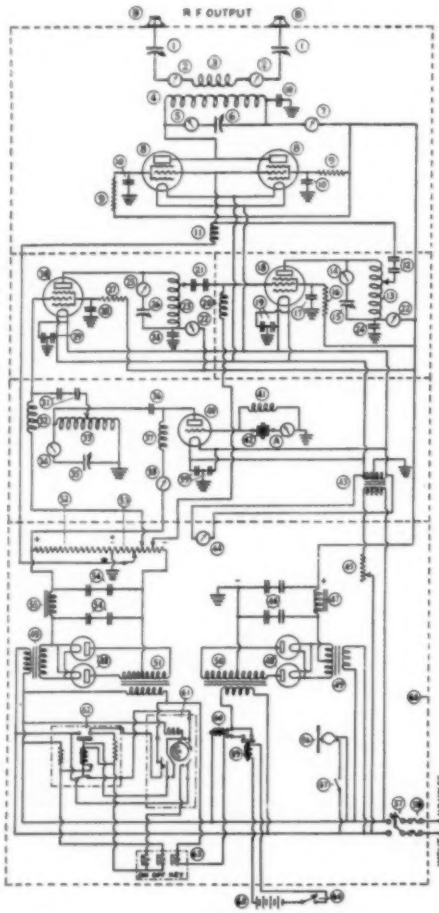


FIG. 1.—SCHEMATIC DIAGRAM AND SPECIFICATIONS FOR THE TRANSMITTER

32. First stage negative grid-supply r.f. choke.
33. Master-oscillator tank inductance.
34. Master-oscillator tank r.f. ammeter, 0–10 amp.
35. Master-oscillator tank condenser, 450 μμfd.
36. Master-oscillator plate-blocking condenser, .002-μfd., 5000-volt.
37. Master-oscillator plate r.f. choke.
38. Master-oscillator plate milliammeter, 0–500 ma., d.c.
39. Master-oscillator filament by-pass condenser, .01-μfd.
40. Master-oscillator tube, W. E., 211-D.
41. Master-oscillator r.f. chokes.
42. Quartz-crystal.
A. Quartz-crystal r.f. milliammeter, 0–250 ma.
43. Filament-supply transformer, 10-volt.
44. A.c. filament voltmeter, 0–15 volts.
45. Filament rheostat.
46. Filter condensers, 1-μfd., 2000-volt.
47. 30-henry choke.
48. Rectifier tubes, Type '66.
49. Rectifier-tube filament transformer, 2.5-volt sec.
50. Plate-supply transformer, 110 to 2000–2000-volt.
51. Transformer, 110 to 1000–1000-volt.
52. 80,000-ohm resistor.
53. 20,000-ohm resistor tapped every 2000 ohms.
54. Filter condenser, 1-μfd., 1000-volt.
55. 30-henry filter choke.
56. Cooling fan.
57. Main-line switch.
58. Main-line fuses.
59. Keying relay, Leach.
60. Keying relay, Dunco, a.c.
61. Time-delay relay (see text).
62. Main control relay.
63. Control box for testing.
64. Main key.
65. Battery for keying, 6-volt.
B. Terminal insulators. "Grounds" indicate connections to frame and shields.

are also in this second compartment. Isolantite insulators are used throughout with the exception of the Micalex ones used in supporting the tank-circuit radio-frequency ammeters. The vertical rod seen in front of the tube in the second compartment is the excitation-lead from the master-oscillator to the first amplifier.

In the third compartment are the first and second amplifier-stages, which are separated by a sheet-brass shield and are identical in construction with the exception of the tuning-condensers. The second-stage tuning-condenser has a split stator in order to make tuning easier at higher frequencies.

In the top compartment two Type '60 tubes are used in parallel to get greater output; the tuning-condenser for this stage is also split to allow better tuning. As can be seen, inductive coupling is used to the antenna. Two antenna-tuning condensers and two antenna-ammeters are used in order to balance the feeder-currents properly. The feeder-leads go out through Isolantite insulators in the top.

Resistors for screen-grid voltage are mounted at the back of each compartment and by-pass condensers for screen-grid and filament are mounted at the sockets of each tube.

The mysterious little black box with the heavy cable coming from it contains the "on," "off," and "key" controls. This gadget allows the operator to inspect any part of the transmitter while it is operating and to make adjustments without fear of being caught too far from the main switch should anything go wrong.

The frame of the set is of 1-inch by 1-inch brass angle and is 20 inches square and 6.5 feet high. Cast brass corner-braces are utilized and these have one-half inch holes in them to allow the passage of high-voltage and "C" bias as well as filament-leads from compartment to compartment. The panels, shelves, and other outside paneling is of one-sixteenth-inch sheet-brass. The main-line fuses are housed in a box on the front of the lower panel. The finish is black crackled enamel and makes a very neat appearance. The mechanical work [2] was done in the instrument-shop of the Department of Terrestrial Magnetism.

There were two difficulties encountered in this set which are worth mentioning. The original plans called for a push-pull output stage; the feed was to be obtained by supplying the preceding amplifier plate through the center of its plate coil and balancing the tube-capacity by the placing of a small condenser at the end of the inductance opposite the tube. The excitation-taps to the push-pull amplifier-tubes were then to be taken from opposite ends of this inductance and the voltages so obtained were supposed to be 180° out of phase and equal in amplitude. In operation this scheme did not work well and was finally abandoned after a month had been spent tinkering with it. However, Byrnes and Coleman, of the Radio Corporation of America — Victor Company, described such a circuit in the *Proceedings of the Institute of Radio Engineers* for March, 1930, and noted no difficulties. It might have been something peculiar to the particular arrangement of this transmitter that caused the trouble, but the fact remains that it did not prove satisfactory in this case.[3]

[2] Done by B. J. Haase.

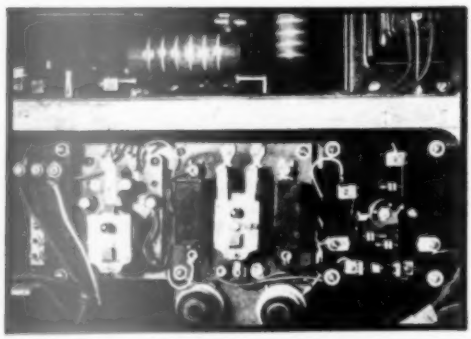
[3] This "balanced amplifier" arrangement for coupling a single-ended stage to a push-pull stage has been used successfully in several transmitters described in *QST* and the *Radio Amateur's Handbook*. It is used in the crystal-

TABLE OF INDUCTANCES FOR W3BWL TRANSMITTER

Frequency Band, Kc/s	M. O. Coil (33)	1st Stage Coil (23)	2d Stage Coil (13)	3d Stage Coil (4)	Antenna Coil (3)
1750	3" dia. 30 turns ⅛" spacing between turns flattened ¼" tubing	(1)	(1)	(1)	(1)
3500	3" dia. 15 turns ¼" tubing spaced ¼" between turns	3" dia. 15 turns ¼" tubing spaced ¼" between turns	(2)	(2)	(2)
7000	Same as 3500	Same as 3500	Not used on this frequency	3" dia. 15 turns ¼" tubing spaced ¼" between turns	1¾" dia. 12 turns 3/16" tubing spaced ¼" between turns
14,000	Same as 3500	3" dia. 12 turns ¼" tubing spaced ¼" between turns	Not used on this frequency	3" dia. 5 turns ¼" tubing spaced ¼" between turns	1¾" dia. 6 turns ¼" tubing spaced ¼" between turns
28,000	Same as 3500	Same as 14,000	3" dia. 8 turns ¼" tubing spaced ¼" between turns	3" dia. 2 turns ¼" tubing spaced ¼" between turns	1¾" dia. 4 turns ¼" tubing spaced ¼" between turns

(1) No output available on this frequency.
(2) Feeder coupled directly through condenser to tank-coil if this frequency is desired.

The other difficulty is still present. Since the framework of the set is used as a common ground, it carries radio-frequency energy; and because the frame has appreciable length, the filaments and screen-grids of the various tubes are actually not at the same radio-frequency potential at any instant. This condition puts the whole frame at



THE RELAY EQUIPMENT MOUNTED AT THE RIGHT SIDE OF THE LOWER COMPARTMENT

The a.c. keying relay is at the left. At its right is the master control relay while the time-relay utilizing a Telechron motor is at the extreme right. One of the r.f. chokes described in the text is just above the relay assembly

a radio-frequency potential considerably higher than ground, even though the frame is grounded. This difficulty might be eliminated through the use of a wooden frame and separate shields for each stage, grounded, but not connected in such a way as to be actually a part of the radio-frequency circuit.

Outside of these two problems the transmitter is very satisfactory (actually the last one constitutes no real loss of efficiency). It works well on the 7000- and 14,000- and 28,000-kc. bands with excellent frequency-stability, sufficient power, and a good note.

The cost of the materials, less tubes, was about $700, which with labor and cost of tubes brought the total cost to about $1800. The actual power-input is 1800 watts to the whole set; of this not more than 200 watts is available to the antenna. The cost from the above then is $9 per watt of output. The cost of operation at six cents per kilowatt-hour is eleven cents per hour. This gives us an efficiency of conversion of eleven per cent, which is one of the reasons why a multi-stage, crystal-controlled transmitter is not too popular if its excellent frequency-stability can be overlooked. However, by definition, frequency-stability was of primary importance in this case.

It is hoped that this transmitter will be in operation at the Huancayo Magnetic Observatory by the end of 1931, and the author is looking forward with pleasurable anticipation to many interesting contacts with other amateurs from this outpost of science high up in the Andes of Peru.

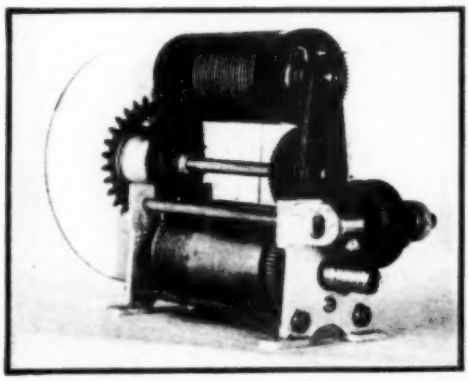
controlled set at W1MK in the intermediate stages, for instance. The push-pull stage might give trouble because of parasitic oscillations unless precautions are taken to prevent them, particularly where higher power tubes are concerned. — EDITOR.

A New Tuning Unit

THE question of covering the high-frequency part of the radio spectrum without plug-in coils is evidently still receiving attention, with the result that a new tuner, designed to work over a range of approximately 3000 to 18,000 kc. with a single tuning control, has been made available.

The new tuning unit, known as the "Vari-Coil," a view of which is shown in the accompanying photograph, consists essentially of a variable inductance across which is connected a variable condenser, and a fixed tickler coil for regeneration. The conductor used in the tuning inductance is flexible copper braid, wound into grooves in a bakelite cylinder. The number of turns in the coil is actually changed as the tuning knob is turned, because the conductor winds or unwinds on a brass cylinder which short-circuits the unused turns. A system of gears works the two cylinders together without placing any strain on the conductor. Further gears operate to turn the midget variable condenser (not furnished with the unit) at the same time, so that inductance and capacity increase and decrease together.

This arrangement provides excellent band-spreading at all points. Thirty complete 360-degree turns of the tuning knob are required to



cover the whole range of the instrument, which, with ordinary plug-in coil systems, would be the equivalent of 60 coils. A numbered paper dial is furnished with the tuner, and shows which of the turns is in use at each setting of the knob. It is expected that an improved dial scheme will be worked out to make possible a rough calibration of the tuner in terms of degrees of rotation for each turn as well as turns themselves.

The Vari-Coil is a product of Arthur J. Hurt & Co., Denver, Colorado.

About the Pentode

Sketching Its Characteristics and Possible Amateur Applications

By Ross A. Hull, Associate Editor

THE pentode tube, about which there has been so much discussion lately, is not by any means new. In 1928, when the tube was already in general use overseas, it was still sitting around in the tube laboratories of this country awaiting the revelation of some real justification for its introduction. It is only during the last month or so that circumstances have conspired to provide us with the pentode in its commercial and thoroughly practical form. Because the tube has been hidden from us for so long, it is not to be wondered at that some amateurs have only the haziest idea of its characteristics and possible applications.

Yes, what about the pentode? Should we get all "steamed up" about it? Has it a real place in the amateur picture? And how does it work, anyway? These are questions being asked by many amateurs in this country at the moment. They are questions to which answers may be found in this short outline.
— Editor.

In any of its present forms the pentode is essentially a five-element output amplifier tube. As it lives to-day, it is not a radio frequency amplifier; it is not the same thing as a "variable-mu" tube; nor has the term "super-control" any place in its descriptive terminology. The tube of course may be used for work other than that of an output audio frequency power amplifier but it will be work for which the amplifier was not primarily designed.

The chief justification for its existence is in its ability to provide a given undistorted power output with a much lower signal input voltage than that required for the three-electrode output amplifier. It is because of this ability that the pentode is spoken of as having a superior "power sensitivity" to the three-electrode tube. One typical present-day pentode is capable of delivering an undistorted output of 2.5 watts with a signal input of 11.7 volts, whereas the universally known Type '45 tube requires an input of 35.4 volts to provide an undistorted output of 1.6 watts. The obvious advantage of this characteristic is that for a given output, the pentode requires less amplification ahead of it. This, in practice, means that the amplifier ordinarily placed between the detector and output tube can be eliminated. The detector is well able to provide all the required excitation voltage for the pentode without the necessity of exerting itself to the point of distortion in the process. In the field of broadcast reception this allows just that simplification of apparatus and reduction of tube array which has so long been economically desirable overseas and which now is so much the concern of set manufacturers in this country.

The tube has another minor though sometimes important characteristic: For a given plate dissipation, the pentode is capable of producing a greater power output than the three-element tube. It is, in other words, more economical of plate power — a consideration of particular importance in most battery operated sets.

From the broadcast angle, the tube has yet another advantage. With the pentode it is readily possible to design (or more correctly, difficult to avoid designing) the output circuits so as to give a rising overall frequency characteristic. Because of this, it is possible to compensate very nicely for the falling characteristic which results from the use of a highly selective radio frequency amplifier.

The important disadvantages of the tube lie in its complexity from the manufacturer's viewpoint and in the fact that it cannot equal the three-element tube in fidelity of reproduction. Should the broadcast listener have had a better opportunity of becoming thoroughly accustomed to the reproduction of a three-element tube operating with a minimum of distortion, the fidelity consideration would be of greater consequence than it actually is.

Turning to the technicalities of the tube, we find that its nearest relative is the screen-grid radio frequency amplifier. The insertion of a third grid between the screen-grid and the plate, and its connection within the tube to the cathode or filament, gives us the pentode. It is this third grid which eliminates the negative resistance characteristic of the usual screen-grid tube, prevents secondary electron emission from the plate and so permits the tube to operate as an efficient power amplifier.

In scanning a list of pentode characteristics it will be seen that the plate resistance values are of a high order. Because of the misunderstandings of the past it is very natural that the amateur should wonder how we obtain a speaker or a pair of phones with an effective load resistance of twice that of the tube. The statement that the load resistance should be twice that of the tube for maximum undistorted output has, in all these

years, rarely been complete. It has not often been stated that this relation holds good providing the tube resistance is that obtained when the plate current is at its peak value. With the three-element tube, this qualifying clause has not been of importance because the plate resistance varies so little over the entire operating range. In the pentode we have a plate resistance which varies widely in accordance with input grid voltages, and a statement of the load requirements for maximum undistorted output is not complete if we fail to differentiate between the plate resistance given in tube data tables and that obtained when the plate current is at its peak value. In short, the actual requirements for undistorted output remain unchanged. In practice we find that the desirable load resistance is usually of the order of one-fourth that of the tube resistance rating.

HARMONIC DISTORTION

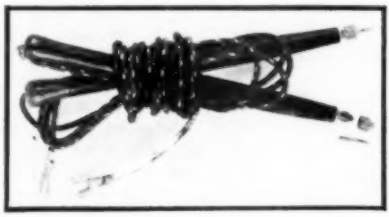
This same change of the tube plate resistance over the range of grid swing is the factor which introduces such serious harmonic distortion. Without going deeply into technicalities it can be seen that in the three-element tube, with its practically constant plate resistance, the relation between plate and load resistance will remain almost unchanged as the grid voltage swings back and forth, and a distortion of the input wave shape is therefore likely to result only from other causes. In the pentode, however, we have a relationship between tube and load resistance which is changing just so long as the grid is receiving a varying input voltage. It is obvious that a change in wave form and consequent harmonic distortion will result. It is certain, too, that the wider the limits over which the grid swings, the greater will the distortion be. This, of course, is an extremely crude and quite unguarded explanation. The broadcast engineer would be justified in asking for another couple of pages in which to complete and qualify it.

IN AMATEUR WORK

In the field of reception we, as amateurs, will be interested in the tube chiefly because of its "sock," "lift," gain, or amplification — call it what you like. With our "any old" phones or speaker (with impedances possibly far from the optimum value) we may be getting third harmonic distortion which would positively alarm the broadcast engineer. But we should worry when we are provided with the opportunity of eliminating an audio stage and keeping the old "B" batteries in commission for another month or two! That there are to be many other useful applications of the tube in amateur work will be made evident by a study of other articles in this issue. In them (see pages 16 and 27) are given the ratings of the two general types now available.

New Test Leads

TEST leads furnished with portable voltmeters of the type used for making tests on radio receivers have not generally been capable of getting into places where they should. The leads shown in the photograph, recently placed on the



market, are designed to make possible quick and easy voltage measurements without danger of shock or short-circuit.

The handles are 5½ inches long, are made of black radion and are tipped in different colors to identify polarity. The contact points are phonograph needles, held in place by small chucks at the ends of the radion barrels. If the point should accidentally be burned off it can be easily renewed. The sharp point easily penetrates the insulation of wires and makes it possible to make voltage measurements without skinning in case no bare leads are accessible. The cords can be furnished with lugs, as shown in the photograph, or with phone tips.

Although primarily intended to meet service men's needs, these test leads will also be useful to the amateur who owns meters. They are made by Blan, The Radio Man, 89 Cortlandt St., New York City.

Strays

The broadcast receiver in W9BAN's shack is run off the same batteries as the ham tuner, and furthermore both feed the same speaker. With both of them running at once the sigs come in with a background of sweet music. This helps drown out the sour a.c. notes!

— - - - —

Test radiovision programs are being transmitted daily from 8 to 10 p.m., E.S.T., Saturdays and Sundays excepted, by W2XCD on 2065 kc. The transmissions are standard 48-line, 15 pictures per second. Reports from persons receiving the transmissions will be appreciated. They should be addressed to the DeForest Radio Company, Passaic, N. J.

— - - - —

W4LM uses an old 75-ohm telephone receiver in series with his bug so he can listen to himself send. The receiver also acts as part of the key thump filter.

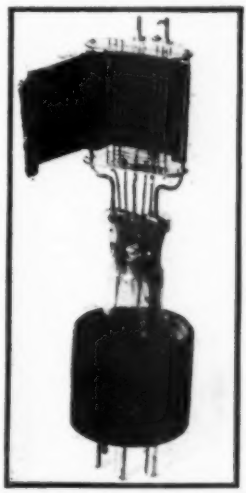
Using Pentode Tubes in the Low-Powered Transmitter

The Pentode as an R.F. Power Amplifier and Frequency Doubler

By Richard S. Briggs, W1BVL*

DURING the early part of this year much attention has been given to the pentode tube for audio power amplification, this tube now being used frequently in place of the triode Type '45. Those familiar with the characteristics of the pentode have considered using it as a radio frequency power amplifier tube, in place of the usual triode or tetrode tubes, although as far as can be learned, not much practical work has been done using the pentode for radio frequency purposes.

The pentode to be considered in this article is the Champion experimental type P-704 power pentode designed especially for use in the last audio stage, this tube being identical with the recent Type '47 pentode and similar to the well known Type '45 triode, having the same filament and bulb. A five-prong UY base is used, the connection being shown in Fig. 2. Compared with the '45, the pentode costs slightly more but has approximately twice the power output and requires only about one third the grid excitation. As an r.f. power amplifier it has even more output than a Type '10 or '65 operating at the same plate voltage, and costs very much less. The normal operating characteristics are given in the table. With the pentode operating as a radio frequency amplifier or buffer tube, however, different operating conditions must be met and will be considered later.



EXPLODED VIEW OF THE PENTODE USED IN THE TRANSMITTER

The arrangement of the elements is explained in the text.

The accompanying photo shows an exploded view of a P-704 pentode. The order of the elements, progressing from filament to plate, is as follows: (1) filament, (2) control grid; (3) accelerating grid or screen grid; (4) cathode or suppressor grid and (5) plate. Without going into too much detail, the purposes of the various grids are as follows: The control grid acts the same as the ordinary grid in a triode. The accelerating grid performs the same function as the screen grid in a tetrode such as the Type '24. It helps to pull electrons from the filament and to pass them to the plate. The plate resistance is consequently much lower than it would be for an equivalent high-mu tube with no accelerating grid. The cathode or suppressor grid has no external connection but is connected to the center of the filament. This grid acts as a trap for any secondary electrons, emitted by the plate, that might tend to travel back toward the accelerating grid. In reality, the pentode is nothing more than a special screen-grid tube with a provision made to reduce the effect of secondary emmission from the plate.

Considering the normal operating characteristics of the pentode we notice that it is a high-mu high plate-impedance type like the Type '65 power tetrode. Its control-grid to plate capacity is quite low, being approximately 1.2 $\mu\mu$fd., which is somewhat lower than that of the Type '52. Most of this capacity is due to capacity between the lead wires in the base. The P-704 or '47 is especially adapted for use as an r.f. power amplifier, although it is primarily designed for audio work. It is also especially adapted for r.f. use as a frequency doubler, which makes it even more useful in a short-wave transmitter such as the one described in this article. The writer has been able to obtain very nearly the same amplification and efficiency using the pentode as a frequency doubler as using it as a straight amplifier or buffer tube.

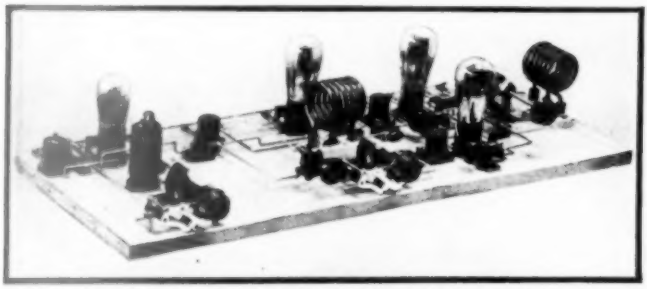
ARRANGEMENT OF THE TRANSMITTER

The breadboard transmitter shown in the photo and circuit diagram of Fig. 1 uses a single Type '27 as a crystal oscillator tube. Three P-704 or Type '47 pentodes are used, one being the buffer or doubler and the other two being operated in the push-pull output stage. Tank circuits L_2C_2 and L_3C_3 are always at the same frequency. When the intermediate pentode stage is used as a doubler, its tank circuit is operated at twice the crystal oscillator frequency, no

*Engineering Department, Champion Radio Works, Inc., Danvers, Mass.

neutralization being needed for the intermediate stage when it is so operated. It is neutralized, however, when operating as a straight buffer amplifier although once the neutralizing condenser C_2 is set, it can be left alone for any frequency of tank circuit L_2C_2 whether the tube is operating as a straight buffer or doubler.

Attention should be called to the fact that tank circuit L_2C_2 is grounded at the center through by-pass condenser C_{10}. This scheme brings both ends of the tank circuit above ground and gives the proper phase relation to excite the grids of the push-pull stage. It is not generally practicable to attempt this unless a pentode is used in the intermediate stage. A Type '10 triode, for example, has such a low output, especially as a doubler, that the grids of the push-pull stage are likely to be under excited.



TYPE '47 PENTODES ARE USED IN THE BUFFER-DOUBLER AND OUTPUT STAGES OF THIS CRYSTAL-CONTROLLED SET

The crystal oscillator, utilizing a '27 tube, is at the left. The neutralized intermediate stage, which operates as a straight buffer amplifier or frequency multiplier and utilizes a '47 pentode tube, is next in order to the right. The two tubes in the neutralized push-pull output amplifier are also '47 pentodes. These tubes show excellent characteristics as frequency multipliers and power amplifiers at amateur frequencies.

The use of push-pull in only the last stage reduces the number of tubes and the amount of equipment needed in the oscillator and the intermediate stage. Also, the use of a push-pull circuit in the final amplifier is advisable because of the ease of neutralizing and the inherent stability of the circuit. Note that the neutralizing condenser C_4 for the tank circuit L_2C_2 is connected to the end opposite that to which the plate is connected. In analyzing the circuit it will be seen that if this neutralizing condenser has the same capacity as the control-grid to filament capacity of the tube, a balanced bridge circuit results, the capacity arms being C_{cg-p} and C_4, the opposing arms being the two halves of the center-tapped tank circuit, equivalent at resonance to a center-tapped resistor no matter what size coil L_2 happens to be. The neutralizing condensers C_5 and C_6 are also equal to the control-grid to plate capacity of the tubes.

Fig. 1 shows the circuit diagram and list of essential parts required for the low power transmitter. The layout of the set quite closely follows the circuit diagram. All terminals are brought out along one side of the board and are connected by a cable to the various supply voltages. The amplifier tank circuit coils are made with either 3/16" or 1/4" copper tubing. They are center tapped and mounted on porcelain single-pole double-throw knife switches, which, after the blade is removed, make ideal plug-in mountings. The oscillator tank inductance consists of a standard five prong receiving coil form.

It is essential to use a fairly large L-C ratio in the tank circuits. This is the opposite requirement to that commonly used in the well known high-C tank circuits of self-controlled oscillators. Unless L-C is kept large the r.f. voltage across the tank circuits is not up to maximum. Incidentally, this rule also holds for tuned circuits in receiving sets. When tank circuit L_2C_2 is operating in the 7000-kc band, L_2 should consist of at least 12 turns of 3/16" copper tubing wound to a diameter of 2¾". The same rule holds true for L_3. All variable tuning condensers are of the receiving type except for C_3 of the last amplifier which preferably should be double spaced, especially if the last amplifier is to be modulated for phone work. The radio-frequency chokes are of the helical wound type and may be purchased in the "25¢ to $1.00" stores. Note that the axes of all three tank circuit coils are at right angles to each other to help reduce feedback through magnetic coupling. Heavy tinned copper wire is used to wire the set.

NORMAL OPERATING CHARACTERISTICS OF THE '47 PENTODE COMPARED WITH THOSE OF THE '45 TRIODE

	Type '47	Type '45
Filament Volts	*2.5*	*2.5*
Filament Amps	*1.5*	*1.5*
Plate Volts	*250*	*250*
Screen Grid Volts	*250*	——
Control Grid Bias	*—16.5 volts*	*—50 volts*
Plate Ma.	*32*	*34*
Screen Grid Ma.	*7*	——
Mu	*100*	*3.5*
Plate Impedance	*40,000 ohms*	*3900 ohms*
Mutual Conductance	*2500 μmhos*	*2000 μmhos*
Max. U.P.O.	*2.5 watts*	*1.6 watts*
Normal Load Impedance	*7500 ohms*	*1750 ohms*
Plate To Control-Grid Capacity	*1.2 μμfd.*	*3.0 μμfd.*

The crystal holder consists of a small UX tube base, the bottom plate fitted snugly into the base and the top plate free to slide up and down. The latter is connected with a fine wire to a terminal at the side of the tube base. Both leads of the holder are brought out through the base prongs. This type holder has worked very satisfactorily

and is quite easy to build.[1] Various crystals with their associated holders may be plugged in quite conveniently.

All voltages except "C" bias and the high plate voltage of the last amplifier can be obtained from a power pack designed to operate receiving sets using '45 and '24 tubes. One 2½-volt filament winding takes care of the crystal oscillator tube filament and intermediate amplifier tube filament. Another 2½-volt filament winding insulated from the first takes care of the two pentodes in the last amplifier. It is advisable to use a separate 500-volt supply so the crystal oscillator plate supply is not affected by poor regulation. A single 45-volt "B" battery suffices for the "C" bias supply.

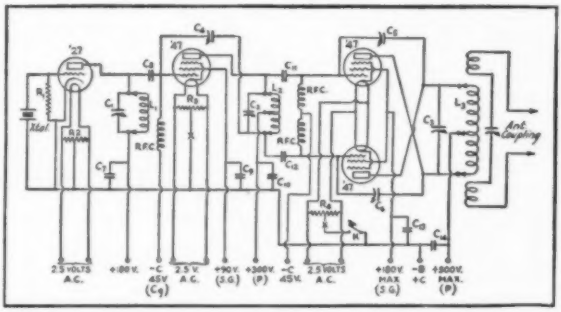


FIG. 1 — SCHEMATIC CIRCUIT SHOWING PENTODE CONNECTIONS

R_1 — 100,000-ohm leak.
R_2, R_3, R_4 — Center-tap resistors, 60-ohm.
C_1, C_3 — 250- or 500-μμfd. receiving type variables.
C_2 — 100- to 250-μμfd. variable, double spaced.
C_4, C_5, C_6 — Very small neutralizing condenser (2-plate midget or smaller).
C_7 to C_{12} — .001- or .002-μfd. mica by-pass condensers.
C_{13}, C_{14} — 250-μμfd. mica by-pass condensers.

ADJUSTMENT

The first step to get the transmitter into operation is to check the crystal oscillator to see that it is working properly. It is essential that a plate milliammeter be used in order to tell when the crystal is oscillating. All voltages should be cut off from the amplifiers for the time being. The crystal tank circuit L_1C_1 is tuned until the plate current suddenly drops indicating oscillation. The minimum plate current is not necessarily the best point to operate, it being rather on the stable side of the "dip"; that is, the side of slightly increased plate capacity. The oscillator plate current should be about 10 ma.

The next step is to apply the specified voltages to the oscillator and intermediate stage only. When this is done the tank circuit, L_1C_1, may have to be re-adjusted. The plate current of the intermediate stage must not exceed 45 ma. when final adjustments are made. The easiest and most effective way to tune the amplifier tank circuits is to use a small 110-volt neon lamp. It should light up brightly when held against one end of the coil with the circuit operating either as a straight amplifier at the crystal frequency, or as a doubler at twice the crystal frequency. After maximum brilliancy is obtained with the neon bulb and the plate current is correct, the neutralizing condenser C_4 is adjusted. In order to do this the crystal oscillator plate current is observed as condenser C_2 is varied to bring tank circuit L_2C_2 in and out of resonance. The neutralizing condenser C_4 is adjusted until the plate current does not duck when C_2 is varied. When once adjusted the condenser may be locked into position and forgotten.

The final push-pull amplifier is brought into operation first by setting the neutralizing condensers C_5 and C_6 as near as possible to about 1.2 μμfd. or approximately the same as C_4. With the oscillator and intermediate amplifier running, the push-pull neutralizing condensers are adjusted until no "flick" occurs in the neon tube held on coil L_2 when the tank circuit L_3C_3 is brought into resonance. C_5 and C_6 should be adjusted so that they are very nearly equal. After this is done, care should be taken to apply the screen and plate voltages properly. This is done by keying. Reduced values of screen and plate voltage should be used until the tank circuit L_3C_3 is in resonance and the plate current not excessive. The total plate current for the last amplifier should not be over 100 ma. under operating conditions.

The next step is to couple the antenna system to the tank circuit L_3C_3. This procedure has been covered before in other articles but is briefly repeated as follows: First, get the amplifiers in operation using reduced power in the final stage. Next, loosely couple the antenna circuit, tuning it until it is in resonance. The coupling should be adjusted so that maximum antenna input is obtained with the least plate current. Also, when C_3 is detuned the plate current should rise equally either side of the resonance point.

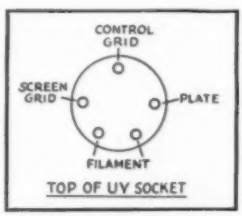


FIG. 2 — SOCKET CONNECTIONS FOR TYPE '47 PENTODE

KEYING METHODS

The one great caution to observe in the operation of pentode tubes is: *Never allow them to run with the plate voltage disconnected without also disconnecting the screen grid.* Of course both may

(Continued on page 88)

[1] See Experimenters' Section, *QST*, May, 1931. — EDITOR.

Army Amateur Red Cross Contest Results

By Capt. Norman Lee Baldwin, W3CXM*

ALL amateur network records were broken on March 16th by the Army Amateurs. With an active list of 747 members, 494 of them copied a message from the Red Cross national chairman, John Barton Payne, which was sent to all the chapters and representatives of the Red Cross throughout the United States. The check of the message was 76 and it was broadcast from the two Army Amateur Net Control Stations WLM (W3CXL) and W3CXM on 6990 and 3950 kc., respectively.

Of the 494 men who copied the message, 481 delivered them personally and had them countersigned by the local Red Cross representative in their town *within twenty-four hours*. A good many of the 494 live in rural communities where facilities for delivery were very limited, and these men had to drive from one and two up to as far as fifteen miles to make delivery. The average time interval between the time the message left Washington and the time that the information was received by the Red Cross representatives throughout the United States was *2 hours and 25 minutes. Three hundred and thirty-eight stations* delivered the messages *inside of 18 minutes*, and these rapid deliveries were made uniformly throughout the United States.

This was the first nation-wide mobilization of the Army Amateur Radio System for the Red Cross and the results were most gratifying. As a contest between the networks of the nine corps areas, the winner was the Seventh Corps Area under Lieut. H. P. Roberts (Corps Area Net Control Station WLU, W9BNT), and second place was won by the Fifth Corps Area under L. G. Windom (Corps Area Net Control Station WLH, W8ZG, W8GZ). Second Corps Area was third and Ninth Corps Area was fourth. In actual percentage the Fifth Corps Area, with an active list of 70 stations, led them all with 97.14 per cent, but suffered a penalty of 3 per cent for having less than 100 stations, whereas the Seventh Corps Area, with an active list of 175 stations, obtained a credit of 8 per cent (added to their 88 per cent) for the size of the network and won the contest.

The first four corps areas, which ranked according to accuracy of copy of the received message, were Third Corps Area, Fifth Corps Area, Second Corps Area, and Ninth Corps Area.

For speed of delivery, they ranked as follows: Third Corps Area, First Corps Area, Sixth Corps Area, and Fifth Corps Area.

Eighty-two per cent of the stations copied the message direct from Washington; Army Amateur radiophones played an active part in rebroadcasting the message, particularly in Florida, West Virginia, and in the Seventh Corps Area.

The direct result of the maneuver was the direct contact made between these expert amateur operators with the nation-wide personnel of the American Red Cross who will require, as they often have in the past, the services of these men to furnish rapid emergency communication in times of disaster when commercial facilities fail.

RESULTS OF RED CROSS MESSAGE DELIVERY CONTEST BY CORPS AREAS, MARCH 16, 1931

335 stations copied and delivered the message inside of 18 minutes. 66% of A.A.R.S. copied message

Corps Area	Total Active Stations	Total Messages Copied	Total Possible Points	Total 6 Point Messages	Total 3 Point Messages	Total Points	% of Possible Points	Add. % Factor	Final Rating %	Average Rec.-Del. Time	Accuracy %	% of A.A.R.S. Copied Message	Total Average Rec.-Del. Time
1....	43	33	258	32	1	195	75.59	−6	69.59	88 min.	98.45	76.74	2 hr. 25 m.
2....	34	28	204	27	1	165	80.88	−7	73.88	3 hr. 47 m.	99.29	82.35	
3....	35	18	210	16	2	102	48.57	−7	41.57	68 min.	99.83	51.43	Average
4....	186	74	1116	71	3	435	38.98	+9	47.98	2 hr. 23 m.	98.99	39.79	Rec.-Del.
5....	70	68	420	68	0	408	97.14	−3	94.14	2 hr. 18 m.	99.30	97.14	Time
6....	68	34	408	33	1	201	49.26	−4	45.26	1 hr. 50 m.	98.88	50.00	338 Stns
7....	175	155	1050	151	4	918	87.43	+8	95.43	3 hr. 19 m.	98.94	88.57	*18 Mins*
8....	57	27	342	27	0	162	47.37	−5	42.37	2 hr. 43 m.	98.72	47.37	
9....	79	60	474	59	1	357	75.31	−3	72.31	2 hr. 57 m.	99.16	75.95	

Kern County Transferred

EFFECTIVE April 15, 1931, Kern County was transferred from the Los Angeles Section to the San Joaquin Valley Section of the Pacific Division. The change was instituted at the formal request of members with the full approval of the Section Managers and the Division Director. Members resident in Kern County now make applications for A.R.R.L. appointments and send activity reports on the 16th of each month (for the preceding month) to S.C.M. E. J. Beall, Box 246, Newman, Calif.

— *F. E. H.*

* Liaison Officer A.A.R.S., War Dept., Washington, D. C.

The Evolution of the Cathode

By H. W. Kadell*

THE well known radio tube of the three-electrode type contains a cathode, a grid and a plate. The cathode is the heart of the tube because it is the storehouse or reservoir of the electrons which are boiled off when the cathode is sufficiently heated and travel towards the positively charged plate. This electronic current is the well known plate current which, when properly controlled by the grid, makes the tube act as an amplifier or detector.

FILAMENT TYPE CATHODES

In the early days of radio, the cathode consisted of a pure tungsten filament which had to be heated to an intense white heat before enough electrons were boiled out and evaporated from it to make the tube function properly. Because of the poor electron-emitting ability of this type of cathode, considerable power was consumed in heating it and its life was short because of the extremely high temperatures involved. The old 201 amplifier tube requiring 1.0 ampere of filament current at 5.0 volts or 5.0 watts of filament power had such a cathode.

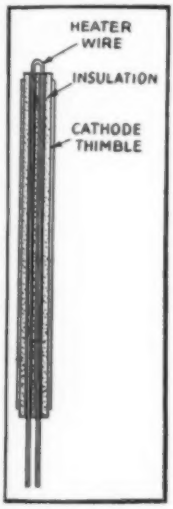


FIG. 1

It was found subsequently that when a small quantity of thorium was added to the tungsten, a cathode could be produced which would emit great quantities of electrons at much lower temperatures. These thoriated tungsten filaments soon replaced the old pure tungsten filaments, and the old 201 tube became the 201-A requiring only 0.25 ampere of filament current or 1.25 watts of filament power.

At about the same time that all this development work was taking place on the thoriated tungsten filament, a great deal of development work was also being done on oxide coatings for filaments. Special coatings were developed consisting of mixtures of barium and strontium oxides which, when properly placed on platinum or nickel filaments, produced very high efficiency cathodes requiring comparatively small heat power for large electronic or plate currents. As an example of the great improvements made in cathodes, it should be noted that the new ER-230 low-drain battery tube will give the same electrical performance as the 201-A but requires only about one tenth as much filament power as the 201-A and only one-fortieth as much as the original 201.

The cathodes of battery operated tubes and of certain a.c. tubes are filaments which are raised to the electron-emitting temperature by the passage of electric current through them. The filament current plays no part in the reception of the radio signals other than affording a convenient way of getting the cathode hot enough to emit the required electrons.

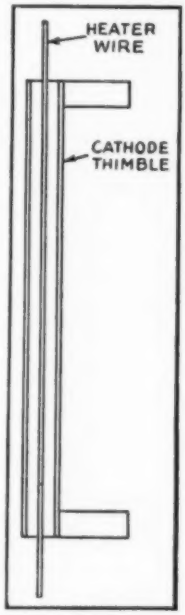


FIG. 2

INDIRECTLY HEATED CATHODES

All of the early attempts to produce a satisfactory "all-electric" a.c. radio receiver were not commercially satisfactory because the filament type cathodes used in all tubes at that time produced entirely too much hum when attempts were made to heat them on raw or unfiltered alternating current. Because of this trouble, a.c. sets did not become commercially feasible until the indirectly heated cathode was conceived along about 1922. Because of the difficulties of manufacture and the attendant cost and operating disadvantages, the indirectly heated cathode type of tube was used only in the detector stage of a.c. receivers until about three years ago. Now it is used in the radio-frequency, detector and audio-frequency stages of practically all makes of radio receivers.

An early type of indirectly heated cathode is shown in Fig. 1. The cathode itself is a hollow nickel cylinder or thimble coated on the outside with a mixture of specially processed barium and strontium oxides capable of emitting great quantities of electrons when heated sufficiently by the a.c. passing through the hairpin loop of wire threaded through the ceramic bushing within the cathode thimble. It will be noted that the a.c. heater is insulated from the cathode. Furthermore, the two heater wires are placed close to one another so that the alternating current fields

*Radio Tube Division, National Carbon Co., 10 East 40th St., New York, N. Y.

set up around the two wires will largely neutralize one another because the currents in the two wires are of opposite phase, with the result that the external field around the heater will be very weak and the resulting hum therefore low. The great disadvantage of this first cathode is the time required for the tube to begin functioning. Under the operating conditions obtaining in the average radio receiver, it generally takes from 40 to 60 seconds for the set to begin playing after being turned on.

FIG. 3

In an endeavor to reduce this excessive heating time, some tube manufacturers developed the cathode shown in Fig. 2. This type of structure resulted in a quick heating cathode but it introduced many serious disadvantages. In the first place, the a.c. heater is of the "straight through" type in which the a.c. heater current is not made to neutralize itself, with the result that this type of cathode produces entirely too much hum for use in the modern highly sensitive broadcast receiver. It will be evident also that the heater wire must be centered within the cathode thimble by the factory worker; an operation that cannot be accomplished satisfactorily in quantity production. In the second place, the heater wire is supported by long wires in glass beads which are not integral with the cathode. Since the heater wire is not covered with an insulator, the rough handling which a tube gets in shipment and the constant vibration which it receives in use produce short-circuits of the heater to the cathode with resulting greatly increased hum and unsatisfactory operation of the tube.

Fig. 3 shows a type of cathode construction which was developed about two years ago in an endeavor to eliminate the serious limitations of the previous cathode shown in Fig. 2. As will be noted, an insulated hairpin is always centered within the cathode thimble. The kaolin insulation is a very hard and brittle substance, however, with the result that the repeated heating and cooling of the a.c. heater, as the set is turned on and off in use, tends to crack off the insulation from the heater, thereby affording an opportunity for the heater to short circuit against the cathode thimble. It also will be noted that the hairpin heater is hand spaced and supported within the cathode as in the previous construction, and hence is subject to the same troubl

Fig. 4 shows the Eveready Raytheon quick-heater, low-hum cathode for use in modern hig sensitivity receivers. It employs a heater of tungsten wire, coiled into a tight double spiral, whic makes it act like a spring. This springy heater is mounted under tension between two insulatin plugs in the ends of the cathode. When the w expands in heating, the springiness of the coil construction takes up the slack, keeping th heater tight and in the exact center of the cathode. When jolted and jarred, the coil can deflec sideways without breaking, but instantly snaj back into position. The bottom insulating busi ing is provided with a short projection which extends up into the heater coil for about two turns. This keeps the end turns from being short circuited against each other as the operator threads the lead-in wires through the two holes in the bushing and thus assures a good rugged construction at this point.

It requires extremely nimble fingers to assemble the tiny cathode parts, and any rough handling during assembly may seriously damage the heater coil. In putting the parts together, the last operation is to stretch the coil tight by pulling on the top supporting rod until the coil stretches slightly, and to weld the collar on the rod to prevent its slipping back through the hole in the bushing. If too much tension is applied to the coil it will be stretched out of shape and some of the turns may become short circuited, thus ruining the cathode and making the tube in which it is placed inoperative. Such defective cathodes are easily detected by the usual inspection methods employed by most tube makers, which is to place the finished tube on test and measure its performance characteristics. With a short-circuited cathode, the tube will not test up to standard and it is rejected.

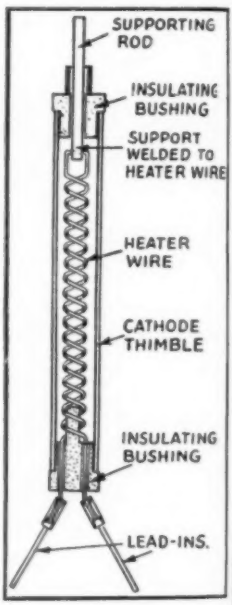


FIG. 4

THE X-RAY SHOWS DEFECTS

But there is a certain percentage of cathodes which are damaged in the assembly but are not inoperative. The turns of the heater coil are almost but not quite short circuited and, while

such a cathode is defective and should not be allowed to leave the factory, none of the usual inspection methods will reveal the damaged condition of the heater coil hidden away inside the metal cathode cylinder.

The heater coil is actually inspected after it has been assembled in the cathode by taking an X-ray picture of every cathode before it is assembled in the tube. The finished cathodes are assembled in shallow wooden trays, one hundred to the tray. An X-ray photograph of the one hundred cathodes is made, and with the developed film, the inspector picks out of the tray all the cathodes having imperfect heaters.

Fig. 5 shows an enlarged X-ray picture of a good cathode and a defective one. In B the heater coil has been pulled or twisted out of shape until several of the turns are almost, but not quite, short circuited. If this cathode were assembled into a tube, it would heat up correctly, it would emit; the tube would have mutual conductance and amplification, and in all ways give evidence of being a good tube. But it wouldn't last long. It would be an unsuspected cripple. The jolts and jars of transportation might complete the short circuiting of the heater, in which case the apparently good tube would be dead when put into use.

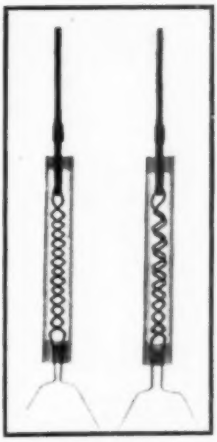


FIG. 5.—THE X-RAY SHOWS UP A DEFECTIVE CATHODE

Although the left cathode might not prove defective on test at the factory it is none the less defective and would give trouble in time. The cathode at the right is perfectly normal.

Even with the most painstaking care exercised in the making of cathodes, the all seeing X-ray reveals four or five out of every hundred that could not be allowed to go into finished tubes.

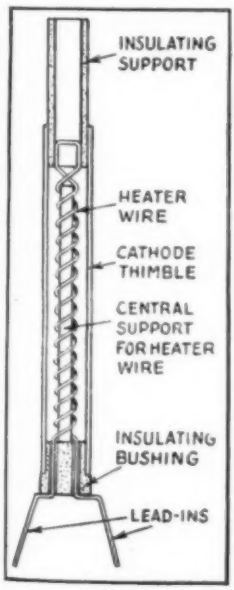


FIG. 6

AN IMPROVED CATHODE

Fig. 6 illustrates an improved type of cathode construction as now used in type ER-224 and ER-227 tubes, designed to reduce the possible defects of the previous type. The projection on the bottom insulating bushing has been lengthened until it now extends for the full length of the heater coil. The advantages of this construction are that the stiff, hard rod, running the full length of the coil, will make it impossible for the operator to twist or pull the coil out of shape when inserting it in the cathode. Further, because of this central support, it no longer becomes necessary to put a strain on the coil to keep it stretched when it heats up. The top bushing centers the free end of the coil in the cathode and holds it accurately in place without imparting any strain to the wire, leaving the coil free to expand and contract as it pleases without danger of harm. This new construction will not make the tube operate any better; it is simply an example of good engineering principles applied to the design of the tube to speed up production and to reduce scrap, and, what is of importance to the buyer of tubes, to add a certain measure of strength, ruggedness and dependability.

Strays

Wonder what some people think when they see a ham transmitter for the first time? W2BOE's landlord complimented him on the fine-looking dashboard in his shack!

We've often seen r.f. chokes smoke, and W8ADJ gives his every chance to do it. It's wound on a cigarette!

SWEEPSTAKES REPORT POSTPONED

The story on the Sweepstakes Contest, originally scheduled for this issue, is still in the process of preparation as we go to press. We have been forced to hold the story over until the July issue so that the task of checking the hundreds of logs may be completed. Scores run much higher than in last year's contest, several topping 20,000.

W5BTL picked this one out of the "Exchange" columns of the local newspaper: "6-tube Atwater-Kent radio with attachments for good milch cow."

I. R. E. CONVENTION

The Sixth Annual Convention of the Institute of Radio Engineers is scheduled for June 4th, 5th and 6th at the Hotel Sherman in Chicago. A number of important technical papers are to be presented during the program. In addition to several inspection trips, an exhibition of component parts for broadcast receivers, measuring and laboratory equipment and other material of interest to engineers will be held.

Pre-Selectors for High-Frequency Tuners

A Band-Pass Filter for the Short-Wave Receiver and Converter

By Ralph William Tanner, W8AD*

THE subject of tuned antennas for the receiver (Experimenters' Section, Oct. 1930) caused considerable comment among the amateur fraternity in general but particularly those transmitting by radiophone. This short article gave some very interesting data which, by the addition of a few extra inexpensive parts, would enable the operator not only to cut out much of the power line QRM prevailing in many districts, but also to increase the selectivity and signal strength as well.

Tuning the antenna circuit by critically coupling two tuned circuits is, in reality, one form of band pass filter. Generally, the amateur, especially the traffic handler, shudders at the mention

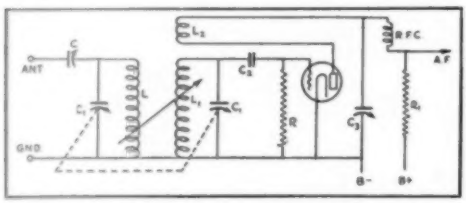


FIG. 1.— CIRCUIT OF REGENERATIVE DETECTOR. A PRE-SELECTOR CUTS OUT POWER LINE QRM AND GIVES BETTER SELECTIVITY

C — 25-μμfd.
C_1 — 2-gang 75-μμfd.
C_2 — 250-μμfd. grid condenser.
C_3 — 25-μμfd. regeneration control.
L, L_1 — Band filter coils.
R — 2 to 5-meg. grid leak.
R_1 — 50,000-ohm plate resistor.

of an added control; which is, no doubt, the reason why so many code men still use the old stand-by, the straight regenerative tuner.

Single control of as many as four tuned circuits is entirely within reason (see page 21, Oct. 1930), so why not use a two-gang condenser to tune the antenna and detector grid circuits? Procuring the condenser should not prove difficult since a regular broadcast type can easily be cut down to the correct size.

Referring to Fig. 1, it will be noticed that the connections are far from being complicated. The antenna series condenser C also acts as a trimmer for the first tuned section. A capacity of 25 μμfd. is high enough. It has been found that with this arrangement, the tuning condensers C_1 may be of the usual size for band spreading since the trimmer C is readily adjusted to compensate for any slight variations. The two coils L and L_1 should have exactly the same number of turns and may be wound on the same form. The spacing between the coils will determine the selectivity and also the number of "dead-spots." If the spacing is too small, dead-spots will be found; and if too great, signal strength will decrease. Pilot coil forms may be used if small wire is employed, other forms generally being too short to hold all windings. Of course any type of plug-in form can be modified by wrapping with a length of cardboard. The tickler L_2 would go over or near the low potential (filament) end of L_1.

The same arrangement could also be applied to a tuned r.f. stage but here the greatest advantage would be in the reduction of line noises. The tickler would, of course, be unnecessary.

In tuned r.f. amplifiers for radiovision reception, such a band filter is almost a necessity in order to bring in the required 50- to 60-kc. band. In this case the coils L and L_1 would be wound as close together as possible. No regeneration should be employed in any tuner for television operation since this increases selectivity, thereby cutting out the latent pictorial details of the picture by cutting the high-frequency sidebands. Too few experimenters realize this fact.

The writer has incorporated this type of band filter in a superhet converter used for both code and radiophone reception in conjunction with a Silver-Marshall 722 broadcast receiver. There are also some other features in this converter such as a separate tube for regeneration which greatly increases the overall gain. No plug-in coils are employed. Probably some of the A.R.R.L. men would be interested in this novel converter; therefore a few details will be given. The circuit is shown in Fig. 2.

Three heater type tubes are employed, a '24 detector, '27 regeneration tube and a '27 oscillator. Both the regeneration tube and detector use separate grid leaks and condensers in order to adjust for highest sensitivity and ease of regeneration. The oscillator is a series-feed type using a grid-leak.

In place of the usual form of plug-in coils, a series of separate coils is employed, any of which may be selected by means of tap switches. A total of five switches is needed and if desired these may be ganged by using five ganging pulleys and bronze strip belting easily procurable from radio mail order houses. Throwing five switches is not, however, a very difficult proposi-

*Lock Box 73, Mulliken, Mich.

tion; in fact it is far simpler than removing and plugging in coils for each band.

Six sets of coils were employed, tuned by a modified two gang broadcast condenser (resulting capacity about 75 $\mu\mu$fd.) for the band filter and a 50-$\mu\mu$fd. midget for the oscillator. Vernier dials are needed for each since the detector tuning is rather sharp, depending upon the degree of regeneration.

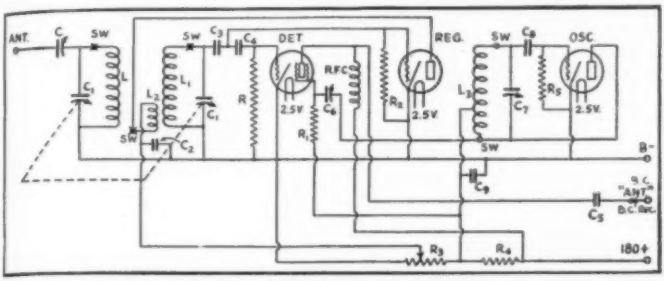


FIG. 2.—SCHEMATIC CIRCUIT OF HIGH-FREQUENCY CONVERTER USING PRE-SELECTION

C—25-$\mu\mu$fd. midget.
C_1—75-$\mu\mu$fd. 2-gang condenser.
C_2—0.5-$\mu\mu$fd. by-pass condenser.
C_3—250-$\mu\mu$fd. grid condenser.
C_4—250-$\mu\mu$fd. grid condenser.
C_5—.002-μfd. I.F. coupling.
C_6—25-$\mu\mu$fd. oscillator coupling condenser.
C_7—50-$\mu\mu$fd. oscillator tuning condenser.
C_8—250-$\mu\mu$fd. grid condenser.
C_9—0.1-μfd. by-pass condenser.
RFC—"short-wave" r.f. choke.
L, L_1—Band filter coils.
L_2—Tickler.
L_3—Oscillator coil.
SW—Band changing switches.
R, R_2—5-megohm grid leaks.
R_1—50,000-ohm screen grid resistor.
R_3—50,000-ohm regeneration control.
R_4—50,000-ohm fixed resistor.
R_5—25,000-ohm oscillator grid leak.

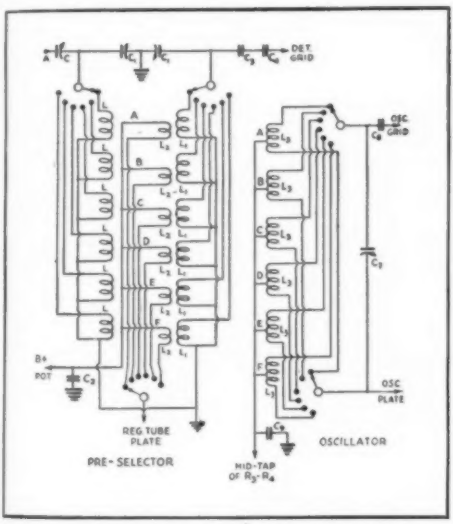


FIG. 3.—HOW THE COILS AND SWITCHES ARE CONNECTED

COIL TABLE

Approx. Range Kc.	L	L_1	L_2	L_3	Tapped from P End
A—1700–3000	50	50	15	34	12T
B—3000–4800	33	33	10	20	8T
C—4700–6000	18	18	8	16	7T
D—5900–9000	12	12	6	11	5T
E—8000–13,000	8	8	5	7	3T
F—13,000–19,000	5	5	4	5	2.5T

L, L_1 and L_2 close wound with No. 30 d.c.c. wire. Tickler L_2 wound with No. 34 enameled. These specifications will not apply in every case. Winding forms 1" diameter.

A coil table is given but this will have to be modified to meet the individual needs. Bakelite tubing 1" in diameter is especially suitable for winding forms because of the small field of the finished coils. The forms for the band-filter section are 3" long and for the oscillator, 2" long.

Mounting the coils and band switches is an individual problem since the sizes and shapes of the various component parts vary greatly. Since the oscillator tuning condenser C_7 is connected from plate to grid, an insulating shaft will be needed if a metal panel is employed.

Regeneration is controlled by means of a 50,000-ohm potentiometer which is part of the voltage divider R_3 and R_4. Energy is fed to the first detector from the oscillator plate to detector screen grid through a small midget condenser, C_6.

Fig. 3 shows how the coils and switches are connected. The coils should be mounted in such a way that the leads are as short as possible.

With this type of converter the sensitivity is considerably greater with the separate regeneration tube than that obtained with a tuned screen-grid r.f. stage and a regenerative detector, particularly at frequencies above approximately 6000-kc.

The advantages of a separate regeneration tube over straight detector regeneration will, undoubtedly, be questioned. With a screen-grid regenerative detector feedback of the second and third harmonics of the intermediate frequency from the second detector can cause such trouble by creating audio howling. Also, if a series feed regenerative first detector circuit is employed, a plate by-pass condenser is a necessity. This condenser would tend to by-pass some of the i.f. currents to ground.

The same disadvantages are found in a regenerative three electrode detector, together with a few others. Of course, if the broadcast receiver with which the converter is used is of rather low sensitivity, the audio howling is seldom present.

Even with a separate regeneration tube or no regeneration at all, second and third harmonic feedback to the first detector can become very disagreeable. This is manifested not only by audio howling but also by a loud growl when a signal is

(Continued on page 38)

Additional Notes on Neutralizing Radio Frequency Amplifiers

By Robt. T. Foreman, W9QT-W9ZZE*

IN answering correspondence with reference to an article in October 1930 *QST*, under the above title, the writer has found it essential to emphasize two points not mentioned in the original article, and it is with the hope of clearing up these final troublesome points that the following is presented.

Referring to "B" of Fig. 1 (reproduced from the original article), it will be observed that the neutralizing condenser of the amplifier offers, in effect, a path to center-tap for radio frequency

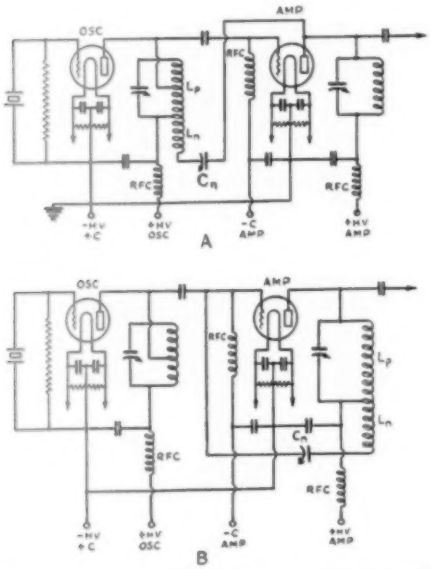


FIG. 1.— TWO METHODS OF NEUTRALIZING SINGLE-ENDED AMPLIFIERS

In A the neutralizing inductance is coupled to the tank circuit of the amplifier or oscillator preceding the stage to be neutralized. This is known as the Rice Circuit.

In B the neutralizing inductance is coupled to the plate tank of the stage to be neutralized. This arrangement has the advantage in that the complete neutralizing circuit is associated with the stage to be neutralized. This is known as the Roberts Circuit.

energy appearing on the amplifier side of the grid coupling condenser. In other words any adjustment of the neutralizing condenser will react on the plate tank of the tube furnishing excitation (buffer or oscillator tube), tending to detune that tank. The absolute amount of detuning will depend on the coupling condenser used, but with usual values, from 100-$\mu\mu$fd. up to 500-$\mu\mu$fd., the effect is considerable.

Because of this detuning, it is imperative that the plate tank of the tube furnishing excitation be *retuned* every time the neutralizing condenser is changed. If this is not done, the plate tank of that tube may be detuned so far that it will no longer be resonant, and the pick-up coil coupled to the amplifier plate tank will show no indication of r.f. energy, even when the amplifier is very far from neutralized. It is more important to retune the plate tank of the *preceding* tube (the one furnishing excitation) than it is to retune the plate tank of the tube being neutralized. The change in tuning of the latter will usually affect the pick-up coil far less than failure to retune the preceding plate tank.

This point is of great importance when the exciting tube is working as a doubler; it is probable that even a slight change in the neutralizing condenser will so far detune the plate tank of the doubler that the latter will no longer be resonant at the desired harmonic. When worked as a doubler, a tube must always have its plate tank accurately tuned; the tolerance seems to be much less than when using the same circuit as a straight amplifier.

If a d.c. grid meter is used to indicate excitation on the amplifier tube, this detuning effect is very noticeable. In this connection it should be noted that any low range d.c. voltmeter requiring 15 or 20 milliamperes for full scale deflection (as most of them do) can be used temporarily as a grid meter and will work just as accurately as the expensive low range r.f. meter usually recommended for coupling to the plate tank when neutralizing. If the neutralizing condenser is adjusted to that point which permits the amplifier plate tank to be tuned through resonance without kicking the grid meter in the amplifier circuit, the tube is perfectly neutralized. Most amateurs have a 150- or 200-volt d.c. meter in the shack, but not all of us possess a spare low range r.f. meter. The d.c. meter is, of course, placed between grid choke and grid bias, its connection being identical with that used on a d.c. plate milliammeter; that is, the "plus" post on the meter is connected to bias battery, the "minus" post being connected to the low end of the grid choke. The use of such a meter to give a visual indication of grid excitation is highly desirable.

(Continued on page 41)

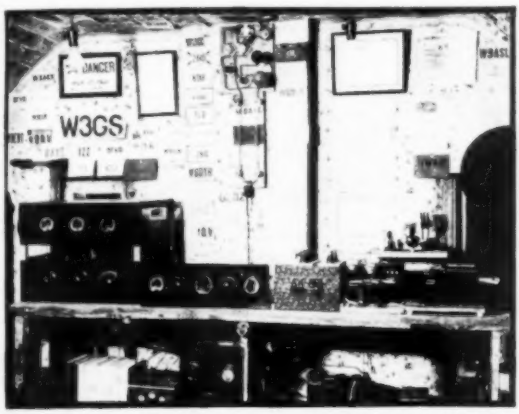
*16 Ashton Road, Fort Mitchell, Ky.

AMATEUR RADIO STATIONS

W3GS, Red Hill, Pa.

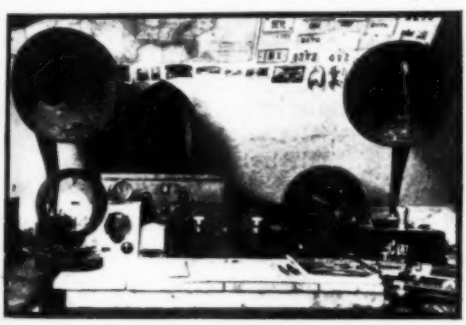
W3GS and Red Hill are located about forty miles northwest of Philadelphia. The owner of the station, Jack Wagenseller, also operates W3BF in Washington, D. C.

There are three transmitters at W3GS. Two of these are small experimental sets used on 1750 and 14,000 kc., while the main transmitter works on the 3500-kc. band. The latter set is crystal-controlled, using a Type '10 oscillator followed by a Type '10 buffer and a '03-A final amplifier. The input to the '03-A is about 150 watts.



THE TRANSMITTERS AND POWER-SUPPLY EQUIPMENT AT W3GS

The crystal oscillator and buffer are in the small panel-mounted unit, with the power amplifier and antenna tuning controls in the frame at the left.



W3GS HAS PLENTY OF LOUD-SPEAKERS ON HIS OPERATING TABLE

Four of them, to be exact, but we imagine he uses the headphones as much as the rest of us. The receiver and monitor occupy the foreground, while a broadcast receiver holds down the rear end of the table.

Two separate power supplies are used on this transmitter. One of these furnishes 200 volts d.c. to the oscillator plate and 500 volts to the plate of the buffer. The other power supply uses mercury-vapor rectifiers and furnishes 1200 volts d.c. to the final amplifier. The low-voltage supply is filtered by 8 μfd. of condenser and two 30-henry chokes, while the high-voltage supply has 4 μfd. and one 30-henry choke. The transmitter is keyed in the filament center-tap of the final amplifier. Battery bias is used on all tubes.

Ordinarily this transmitter operates on 3646 kc., but several crystals are kept handy in plug-in mountings so that different frequencies may be used if desired. The frequency change can be made in about 30 seconds.

A Zeppelin antenna has been found to be the best for 3500-kc. work. It is a horizontal half-wave affair, 127 feet long, with 65-foot feeders. This same antenna is used on 1750 kc. by adding a small loading coil. On the 14-mc. band a single-wire fed Hertz antenna is used.

A monitor is used during all transmissions, as it improves the sending and also assures the operator that everything is working properly. A dynatron frequency meter is available for accurate frequency checks.

The 1750- and 14,000-kc. transmitters both employ self-excited circuits of the TNT type. These sets are used only occasionally, but the 1750-kc. outfit is handy for local schedules when bad skip distance effects occur on other bands.

A great many types of receivers have been tried at this station, but the old reliable detector and two-step has been found to be the most satisfactory from the standpoint of reliability and simplicity of operation.

W3GS is a Route Manager, so all equipment has been built to make possible consistent and accurate handling of traffic. Lately, however, W3GS has been going in for 3500-kc. DX during those small hours when good hams are supposed to be in bed but aren't, and since last December has QSO'd G6WY twelve times, G6RB ten times, G5BY once and G2IP once (up to March, 1931). All U. S. districts and 45 states have been worked on 3500 kc. and good reports have been received 1500 miles away with the 1750-kc. transmitter.

W6ESA, Los Angeles, Calif.

W6ESA came on the air December 24, 1928 — just in time to get started under 1929 conditions. To keep up with 1929 requirements it was decided that crystal control was the thing, and the neat panel-mounted outfit shown in the photograph of the station is the result. Carson C. Taylor, 310 S. Irving Boulevard, Los Angeles, is the owner of the station.

The transmitter starts out with a crystal-controlled Type '10 oscillator on 3587 kc., followed by a Type '65 doubler. The latter tube feeds another '65 which serves to step up the excitation (on the same frequency) for the Type '52 amplifier. The latter is neutralized, of course.

W6ESA

An efficient-looking layout. The transmitter is a crystal-controlled affair with a Type '52 tube feeding the antenna.

A 550-volt power unit furnishes pure d.c. for the oscillator and two following amplifiers. A pair of R81 Rectobulbs rectifies the output of the power transformer, and a brute-force filter smooths the resulting d.c. A 30,000-ohm voltage divider across the output of this power supply is tapped at the proper point to give 350 volts for the plate of the crystal tube. The plate supply for the '52 consists of a 2000-volt transformer, a pair of R3 Rectobulbs, and a brute force filter of the same constants as the one on the small power supply, except that the voltage ratings are ample to handle the voltages involved. A 6-henry choke is connected between the rectifiers and the input side of the filter. A Silver-Marshall No. 699 power pack furnishes variable grid bias for all tubes.

The transmitting antenna is a 7000-kc. Zepp, 64 feet long, with 32-foot feeders. Two masts, one 70 feet and the other 45 feet high, support the antenna. The guy wires for these poles are broken up by insulators every seven feet.

An a.c.-operated Super-Wasp receiver is used at W6ESA. This outfit has been modified so that each of the bands is spread over most of the tuning dial. A conventional monitor is used.

W6ESA has always been active in traffic handling and tests, and holds appointments as ORS and OBS. It is also an official broadcast station for the local ham club. A complete log is kept and a record of all traffic and correspondence handled is always ready for reference.

Pre-Selectors for High-Frequency Tuners

(Continued from page 35)

tuned in "on the nose." The question arises, would it not be better to peak the i.f. stages at a frequency where the third harmonic would fall outside of the high-frequency bands? The third harmonic of 500 kc. is 1500 kc. which is near the low frequency end of the amateur bands. And here another question arises — "two-spot" tuning.

At, let us say, 14,000 kc. the oscillator would be tuned to either 14,500 or 13,500 kc. At the high beat a signal on 14,000 kc. would be heard and, due to the naturally broad tuning qualities of the first detector circuit, if a station were operating on 13,000 kc. this also would be heard. The addition of another tuned circuit ahead of the detector will eliminate this interfering station and can be in the form of a band pass filter or a tuned r.f. stage, preferably the former.

The operation of this type of converter is not at all difficult. The desired signal is tuned in with the oscillator and band filter controls. To increase the volume, the regeneration control is increased to a point a degree or two below oscillation. The regeneration tube should not be permitted to oscillate during the course of operation, and, as a rule, is used only on very weak signals. If the broadcast receiver contains a band-pass filter, the ratio of signal to static (man-made as well as natural) is startlingly good to say the least.

Strays

Amateurs interested in 28- and 56-mc. activity have the opportunity of checking on scheduled ultra-high frequency transmissions that are being made by WLY, Fort Monmouth, New Jersey. The frequencies range from 10 mc. to 40 mc. and the complete schedules from April to January, 1931, appear on page 4 of the April O.R.S. bulletin of the Communications Department. Any one interested may have a copy of these schedules on request. Address the Communications Manager, A.R.R.L., West Hartford, Conn. Get a copy, post it in the shack, and listen for these transmissions.

EXPERIMENTERS' SECTION

Neon Tube Oscillators

IN THE March Experimenters' Section some neon tube oscillator circuits were suggested by Joseph G. Hanhauser, Lansdowne, Pa. Mr. Hanhauser now sends us some additional

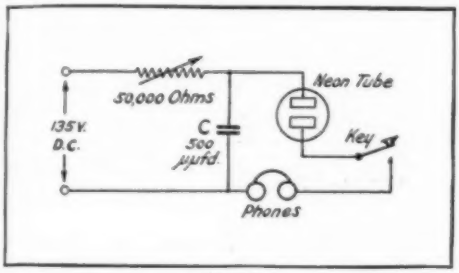


FIG. 1

circuits which may be of interest.

The hook-up in Fig. 1 is a simple audio oscillator, using only the parts shown in the diagram, for code practice. The pitch of the note can be controlled by varying the 50,000-ohm resistor and by making the condenser *C* variable.

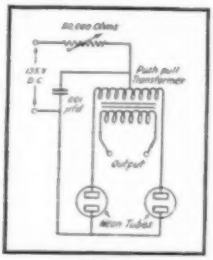


FIG. 2

Fig. 2 is a push-pull audio oscillator, utilizing an ordinary push-pull output transformer as the tuned circuit. It may be put to a variety of uses for which audio oscillators are suitable.

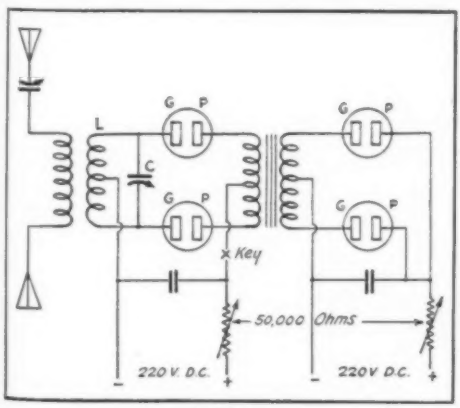


FIG. 3

The third circuit, Fig. 3, is that of an experimental transmitter. The neon tubes in this case are the 220-volt, 2.5-watt size. The tuned circuit, *L-C*, should be suitable for the band employed, and the antenna tuning is similar to that used with any other form of oscillator. The right-hand side of the diagram will be recognized as Fig. 2, and this part of the circuit may be omitted if no modulation is desired. No data is given on the upper frequency limits attainable with a radio-frequency oscillator of this type, but it is probable that the circuit will work on frequencies as high as 3500 kc. and possibly higher. The variable resistors must be capable of controlling five watts of power in each case.

A Few Hints on Crystal Control

The following letter from Al. Haagenson, W9EEP, Barnesville, Minn., brings out a few points which are worth keeping in mind in the operation of frequency doublers. Possibly some others have had the same troubles.

"Here at W9EEP two 210 tubes are used in parallel as doublers to excite one 852 or two 852's in a push-pull amplifier. Five hundred fifty volts is applied to the plates of the doublers and they draw 150 ma. At this input one 210 takes a great deal more of the load than the other, due no doubt to a difference in characteristics. This condition is not satisfactory for efficient operation, besides being hard on one 210 tube.

"To correct this condition two excitation condensers, C_1 and C_2, Fig. 4, were installed; also two r.f. chokes RFC_1 and RFC_2. An individual lead was then run from each choke to separate taps on the bias battery. It was found that one 210 took ten volts higher bias than the other to make the plate load even up. The variable taps can be obtained by opening up one of the batteries or adding several of the 4.5-volt units in the grid lead to the tube taking the highest plate current. A potentiometer could be used also.

"It has also been found advisable at W9EEP to provide some sort of control on the crystal oscillator to permit variation of the amount of excitation supplied the doublers. In Fig. 4 clip *A* on the oscillator tank inductance is generally shifted up or down to vary the excitation when a fixed input is used on the crystal oscillator. A point can be found where clip *A* will cause the doublers to oscillate much like a t.p.t.g. circuit. When this happens everything is all wrong, and a broken crystal may result. Clip *A* should be permanently soldered to the plate end of the oscil-

lator tank inductance and the power of the oscillator varied by adjustment of Clip *B* and potentiometer R_1 which controls the plate voltage. This eliminates the possibility of oscillation in the doubler. It also helps to maintain a high r.f. potential on the grids of the doublers, which is desirable when high bias voltage is used."

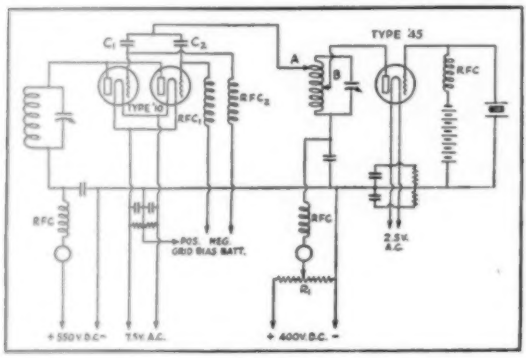


FIG. 4

— - - - —

A Good Speech Amplifier

W8DBQ vouches for the speech amplifier shown in Fig. 5, an arrangement designed to give high gain and good quality when working out of a double-button microphone and into a Type '50 modulator or a third speech amplifier tube taking a comparable grid swing. It is used by W1ABY and W8DBQ with excellent results.

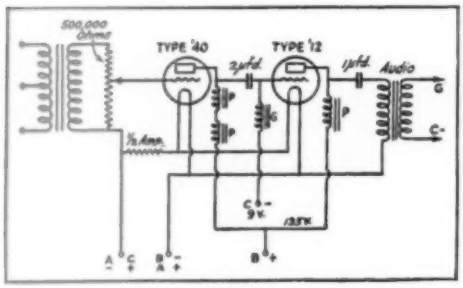


FIG. 5

A Type '40 high-mu tube is used in the first stage, and is coupled through audio impedances to the grid of a Type '12 or '12-A. The latter works into a good quality audio transformer of the usual type, but the plate voltage is fed in through another audio choke, thus keeping the d.c. out of the transformer primary. The impedances marked "P" and "G" are Samson impedances, Types P and G respectively.

The amplifier may of course be used with a single-button microphone as well.

Loading the Antenna

It often happens that there is not room enough to put up a Hertz antenna of the length necessary for a given band, and various schemes of loading have been tried to bring the fundamental to the right frequency. One idea was suggested in the Experimenters' Section in March *QST*. James Wood, W1AYG, uses a similar arrangement, except that the loading coil is at the center of the wire instead of a coil at each end. His letter gives some dope on how to go about adjusting the antenna coil, particularly when it is to be used with a single-wire feeder.

"The only place in a new location that I could erect a 14,000-kc. antenna was a stretch of 25 feet, and this meant a shortage of approximately 9 feet. My solution was to insert in the center of the antenna a coil of copper tubing to make up the 9 feet. This is not a new stunt but most of the fellows never think of these simple tricks unless *QST* says so and then it takes some explanation on how to do it.

"I cut my 25-foot length of wire and then cut it in the center, making two 12.5-foot wires. These were laid out on the floor in a straight line. To one end of one wire at the center of the system I fastened a coil of ¼-inch tubing with 15 turns 2½ inches in diameter. The other length of wire was run through an ammeter and clip for varying the number of turns in the coil. My transmitter was then coupled by a single-wire feeder, which temporarily can be fastened about a foot from the coil, either side. With excitation from the transmitter the antenna coil turns are varied for maximum current. This point is not very critical. Counting the turns active in the coil after adjustments are complete, a similar coil is constructed and a bakelite strip inserted in the center to take up strain due to suspension. The proper place for feeder is found by putting in series with the line itself a couple of meters or flashlite bulbs spaced ¼ wave apart and sliding the feeder line connection along the antenna until the current in the feeder is same on both indicators. On some systems this point might even be on the coil itself. It is not hard to find and once located will not vary regardless of the length of the feeder. The antenna may then be put up. In my case it seems to be as good as the total length of 33 feet would have been."

— - - - —

Five-Band Antenna

A further scheme for working a single antenna on all bands is suggested by Guy H. Grossin, F8RJ, ex-F8WHG. Satisfactory operation is secured on all amateur bands between 1.75 mc. and 28 mc.

Fig. 6 shows how the antenna is constructed and used on the various bands. The flat-top portion is 21 meters long (approximately 68½ feet)

while the vertical part, which on some bands acts as a feeder and on others as part of the radiator, is 15 meters (49 feet) long. An open-circuiting switch is inserted in the second feeder wire at a point 2.5 meters (about 8 feet) from the transmitter. The connections for the antenna tuning apparatus on each of the bands are shown in the diagram.

For 28-mc. work the switch is opened, and the 8-foot length of feeder and the opposite 8-foot portion of the continuous feeder act as a pair of quarter-wave Zepp feeders, the remaining portion of the continuous wire being a Hertz antenna 3½ wavelengths long. On 14 mc. the switch is closed,

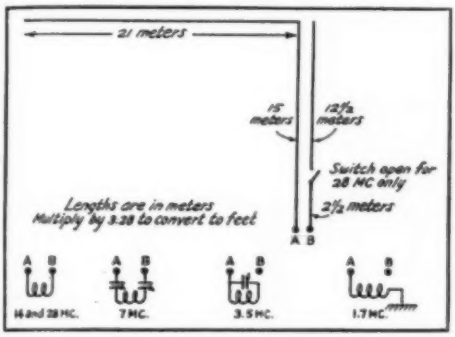


FIG. 6

and the antenna again operates as a Zepp, this time full wave with ¾-wave feeders. For 7 mc. work the antenna is the conventional half-wave Zepp with series-tuned feeders electrically equivalent to a quarter wave.

When the antenna is to be used on 3.5 mc. the second feeder is disconnected and the other is directly coupled to a tuned tank circuit which is in turn coupled to the transmitter. In this case the whole length of wire acts as a radiator approximately one-half wave long. For 1.75 mc. the same antenna is used, but is connected to ground through a coupling coil, forming a grounded quarter-wave antenna.

That this arrangement works out well is proved by the work FSRJ has done with it. On 1.75 mc. distances of over 2000 miles have been covered; W stations have been worked on 3.5 mc.; and all continents on both 7 and 14 mc., including some 118 countries altogether. The transmitter input was about 100 watts.

— - - - —

An Odd Antenna System

VE3GG, M. J. Caveney, Hydro, Ontario, Canada, sends this one in as a suggestion for fellows who have no space at all for an outside antenna. This antenna will fit in almost anything but the smallest of closets. It looks as though it couldn't possibly work — but it certainly has produced results for VE3GG.

Fig. 7 shows how the antenna is arranged. Any kind of wire can be used, and the spacers are ordinary porcelain cleats often used in house wiring.

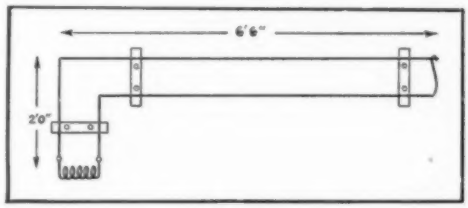


FIG. 7.

The open ends of the wires are not connected together electrically — one is simply hung over the other to take up the slack. The coupling coil consists of seven turns of copper tubing wound to a diameter of three inches.

Using this antenna and an old UV-202 with 500 volts on the plate, VE3GG kept daily schedules with Europe over a period of months, and worked stations in France, England, Italy, Belgium, Holland, Argentine, Uruguay, Porto Rico, Africa, Sweden and New Zealand. This was all on the 14,000-kc. band.

Additional Notes on Neutralizing Radio Frequency Amplifiers

(Continued from page 36)

The second troublesome point in neutralizing arises when a small tube, say a '01-A, is used to excite a 50 watter; or when a '10 is used to excite a 250 watter. In such cases it is frequently found that the larger tube effectively by-passes the small amount of r.f. energy available, and it is difficult to find enough r.f. in the plate tank to indicate neutralization with the pick-up coil. The path to the center-tap (usually grounded) via the filament is of so much lower impedance than the alternative path through the plate tank that the energy never reaches the plate tank. In such cases the ground should be removed from the center-tap; if this does not suffice, the center-tap lead may be opened, and there will then be sufficient r.f. energy in the plate tank to permit neutralizing in the usual manner. With less discrepancy between the rating of the amplifier and tube furnishing excitation, this problem does not arise. For example, no trouble will usually be experienced when working a type '10 into a 50 watter, or a 50 watter into a 250 watter.

It seems needless to point out that the antenna tank must be disconnected to prevent the same effect mentioned above; that is, to prevent the antenna tank from absorbing all the energy being supplied to the amplifier. One correspondent failed to observe this point and fractured a perfectly good crystal.

Making the Most of the Standard Frequency Transmissions

How to Get More Points in the 3500 kc. Band—Future Schedules

MANY are the complaints from amateurs who find that phone QRM on the low frequency end of the 3500-kc. band makes it difficult and often impossible to get the 3500-, 3550-, and even the 3600-kc. signals transmitted by the s.f. stations on the *A* schedules. Very few have realized that it is not necessary to get these calibration points from a 3500-kc. band s.f. transmission and that they can be obtained from a 7000-kc. or even a 14,000-kc. transmission with just as good accuracy and a great deal more ease. Here is the way to do it:

Using a 3500-kc. oscillating frequency meter, such as a dynatron or even a monitor, and a receiver tuned to the 7000-kc. band, pick up the 7000-kc. s.f. signal transmitted on a *B*, *BB*, or *BX* schedule and heterodyne it with the second harmonic of the frequency meter. This will give the 3500-kc. calibration point for the frequency meter. Using the same method, the 7100-kc. transmission will give the 3550-kc. calibration point, the 7200-kc. transmission the 3600-kc. point, and the 7300-kc. transmission the 3650-kc. point. Using the 14,000-kc. band transmissions, with a receiver tuned to that band, and heterodyning the signals with the fourth harmonic of a 3500-kc. band frequency meter, will give calibration points every 25 kc. from 3500 to 3600 kc., inclusive. This will suit those amateurs who have asked for points at 25-kc. intervals in the 3500- to 3550-kc. phone band.

Incidentally, a 3500-kc. band oscillating frequency meter can be used quite satisfactorily to give calibration points for tuning up in the 1750-kc. band. Here the receiver, monitor, or transmitter, tuned to the 1750-kc. band, is made to oscillate and its second harmonic is beat against the fundamental of the frequency meter. The 3500- to 4000-kc. calibration of the frequency meter will be directly useful for tuning between 1750 and 2000 kc. since the second harmonics of these two frequencies are 3500 and 4000 kc. The 1715-kc. band limit can be quite accurately spotted by extending the calibration curve of the frequency meter to 3430 kc. or by getting an extra calibration point from a commercial station operating on a known frequency below 3430 kc. This method makes the 3500-kc. band s.f. signals entirely adequate for 1750-kc. band calibrations and makes unnecessary the transmission of s.f. signals in the latter band.

Here are the s.f. transmission schedules for June and July. Use them and send in a report on how you get them. A msg or card addressed to *QST* will bring a supply of handy reporting blanks, postpaid.

DATES OF TRANSMISSION

June 5, Friday	A	W1XP
	B	W9XAN
	B	W6XK
June 12, Friday	BB	W1XP
	B	W9XAN
	A	W6XK
June 13, Saturday	BX	W6XK
June 14, Sunday	C	W9XAN
June 19, Friday	BB	W6XK
	B	W1XP
	A	W9XAN
June 21, Sunday	BB	W9XAN
	C	W6XK
June 26, Friday	C	W6XK
June 28, Sunday	C	W1XP
July 3, Friday	A	W1XP
	B	W9XAN
	B	W6XK
July 10, Friday	BB	W1XP
	B	W9XAN
	A	W6XK
July 11, Saturday	BX	W6XK
July 12, Sunday	C	W9XAN
July 17, Friday	BB	W6XK
	B	W1XP
	A	W9XAN
July 19, Sunday	BB	W9XAN
	C	W6XK
July 24, Friday	C	W6XK
July 31, Friday	A	W1XP
	B	W9XAN
	B	W6XK

STANDARD FREQUENCY SCHEDULES

Friday Evenings Schedule and Frequency			*Friday and Sunday Afternoons Schedule and Frequency*		
Time (p.m.)	*A*	*B*	*Time (p.m.)*	*BB*	*C*
	kc.	*kc.*		*kc.*	*kc.*
8:00	3500	7000	4:00	7000	14,000
8:08	3550	7100	4:08	7100	14,100
8:16	3600	7200	4:16	7200	14,200
8:24	3700	7300	4:24	7300	14,300
8:32	3800		4:32		14,400
8:40	3900				
8:48	4000				

Saturday Morning Schedule and Frequency	
Time (a.m.)	*BX*
	kc.
4:00	7000
4:08	7100
4:16	7200
4:24	7300

The time specified in the schedules is *local standard time at the transmitting station.* W1XP uses Eastern Standard Time, W9XAN, Central

(*Continued on page 82*)

THE COMMUNICATIONS • DEPARTMENT •

F. E. Handy, Communications Manager — E. L. Battey, Asst. Coms. Manager

The Viking Disaster

AMATEUR radio again proved its worth as an emergency communications service when the sealing ship *Viking* carrying members of a sound-movie expedition exploded off Horse Island, near Newfoundland, on March 15th. Several members of the party were killed and many wounded.

Stations W1KH, W1ASF, W1WV and W1APD did some splendid work in obtaining news from Newfoundland regarding the extent of the disaster, number wounded, names of those dead and those safe, and furnished much valuable information to rescue parties leaving for the scene of the disaster. Practically all news for the press received from Newfoundland came via the medium of amateur radio.

When the relief plane piloted by Bert Balchen was preparing to leave Boston for Horse Island to bring food and aid to the victims marooned there W1KH was able to keep in touch with "VO" stations to get weather reports and other pertinent data. He had a half-hour schedule with one "VO" station and W1ASF had the same with another "VO." They kept this up all day and night of the 19th. W1KH had a total of six hours' sleep on the 18th and 19th! Real amateur coöperation! The plane depended on the reports received by W1KH and W1ASF for dope on weather conditions in the north. Departure was delayed on account of bad reports received. They continued to get reports until 9 a.m. on the 20th — the plane got away an hour later. The flyers were very profuse in their thanks to amateur radio for the "invaluable service" rendered. W1KH writes: "W1ASF was tireless in his efforts to help out, and showed a wonderful spirit of team work. W1WV also was a mighty big help. Since the plane expected to base at St. Anthony and wanted weather conditions there, we kept the following schedule: W1KH got weather from a station near St. Anthony, 'phoned it to W1ASF, who gave it to a station near St. John; and this station in turn 'phoned it to the flyers."

W1APD at Naugatuck, Conn., and W1AL at League Headquarters gave incidental coöperation during the period of the emergency work.

W1AOX at South Manchester, Conn., reports on the coöperation of a number of 3500-kc. 'phone stations in trying to obtain news from Horse Island: "At the request of newspaper reporters W1AVK asked me to put his station on the air as soon as possible on the afternoon of March 17th to endeavor to get some word from the *Viking*. I got on the air at 4:30 and immediately contacted W1BMB, Rockland, Mass., who agreed to help out by passing the word along and trying to get other amateurs to cover the commercial frequencies below 500 kc., in case any word was coming through there. I then sent out a QST with all the dope I had. W2CQI called and said he would do his part. Then worked W2CVK, who said he would get the help of an operator at an Army station in New Jersey who could cover both high and low frequencies, sending and receiving, under Army calls. I next contacted W1WK and gave him the story. By this time many stations were on the air working on the emergency. When W1AVK came home later in the evening we worked W1AEL who tried to give us the results of W1WK's work but due to QRM we could not copy him. Later W1WK was again worked and he reported that he had contacted VE2BG and learned that a large Canadian Government tug had reached Horse Island with some food and medical supplies and was in wireless communication with the mainland. W1GW also helped out. All this was on 3518-kc. 'phone."

Radio Division Suspends License

THE operator's license of an amateur radio operator residing in Boulder, Colo., has been suspended by the Department of Commerce for unlawfully transmitting phonograph records and other infringements of the regulations governing the operation of radio stations. The Supervisor of the Ninth Radio District with headquarters at Chicago, Ill., submitted a report showing that the operator in question, a student in a Colorado college, also rebroadcast programs originating with broadcasting station WJZ, New York City, without first obtaining permission of this station. Fictitious call letters, KIOU, were used and the transmissions which were sent out were on a frequency allocated only for the use of broadcasting stations.

From an investigation it seems that the young man from his home where the station was located was engaging in playing a prank on his professors, one of whom put an end to the program after about forty minutes of music interspersed with a few "wise cracks."

Mr. W. D. Terrell, Director of the Radio Division of the Department of Commerce, stated that, while the suspension of this operator's license is not in a large degree exacting the full penalty under the Radio Act of 1927, which provides a maximum of a $5,000 fine or imprisonment for a term of five years, he is of the opinion that the suspension will serve as a warning to others who may be over-desirous of running a station of their own without first meeting the requirements of obtaining a construction permit and a station license for its erection and operation.

The Nicaraguan Earthquake

IMMEDIATELY upon receiving word of the disastrous earthquake which destroyed the city of Managua, Nicaragua operators of amateur radio stations throughout the United States, and particularly in Washington, D. C., proceeded to do all in their power to establish communication with the stricken area and provide emergency communication. Their efforts were successful!

Coöperation and service rendered by certain Washington, D. C., amateurs is worthy of special mention. Starting April 2nd W3PN contacted NN1NIC at Managua and up to April 12th handled a total of 133 messages. On the night of April 3rd alone, copying through heavy QRM a signal which broke, jumped and faded, W3PN received 39 messages. These were turned over to the telegraph companies for delivery. W3BAT worked NN7NIC at 9:45 a.m. March 31st. He also contacted NN7XJ ón April 2nd and handled 22 messages. On April 9th he was in communication with NY1AA in the Panama Canal, enroute to Managua, and handled 22 additional messages. W3APJ did good work listening for Nicaraguan stations on the 14-mc. band. He established contact with TI2FG in Costa Rica as a possible aid in an emergency. B. E. Stahl, operating engineer of WRC, rendered valuable service at W3CAB on the night of April 2nd copying traffic from NN1NIC. Watch was kept on W3PN and NN1NIC who were in communication. From the handling of the communication it appeared that reception was fairly good at W3CAB and poor at W3PN. W3CAB made telephone contact with W3PN and had him ask the operator at NN1NIC to send the messages in strings of five. Traffic was then handled as follows: NN1NIC to W3CAB where it was copied and OKs and fills 'phoned to W3PN,

who requested the repeats of NN1NIC. In this manner, with uninterrupted telephone service, 56 messages were handled in three hours' time. Including 20 messages previously handled direct by W3PN this made a total of 76 messages received from NN1NIC that night. Considerable effort was expended on various evenings of the emergency communication in clearing interference from the Nicaraguan signals. Distant interfering stations were worked by radio and local stations were called by telephone and notified of the interference. In every instance the operators were quick to coöperate in improving conditions. Quantico, Va., and local points were called by telephone to notify them that they were being called by Nicaraguan stations when it was thought that they had not heard the stations direct. Accounts of the service given by amateur radio were carried in various newspapers throughout the period of the coöperation. The messages handled for the most part announced to relatives in the States that the signers had survived the disaster.

The information necessary to enable the Washington amateurs to promptly locate and contact Nicaraguan stations was furnished by the Navy Department within three or four hours after the earthquake. Many of the amateurs handling the emergency traffic were members of the U.S.N.R.

W3AWS at Quantico, Va., handled 83 messages from NN1NIC on the night of the 'quake. W3CXL was the first Washington station to contact Nicaragua. Other stations which are known to have given incidental coöperation in furnishing information and in relaying and delivering Nicaraguan traffic are: W9DOE, W9FTA, W6DPJ, W4MK, W3BWT, W2BGO, W6ASH, W4QF, W3AST, W3CXM, W4DV, W1AZW, W1FE, W1LQ, W1MK and W1UE.

Re: The Amateur Code

By Rufus P. Turner*

In January *QST* (page IV) we invited contributions on every phase of amateur *communication* activity. New ideas and viewpoints, criticisms of and remedies for conditions, hints on DX, suggestions concerning radio club organization, information on interference elimination, exceptional two-way communication work covering emergencies, athletic games and trips, timely attention to operating practise, commentary on the place of radio-telephony, experimenting or development work in present-day amateur radio, data on low-power possibilities, 1750-kc. 28–56 mc. operation, etc., *all* are needed. There is plenty of romance and real accomplishment in amateur work. Read this contribution and the one presented last month. Then give us some real operating stories or the benefit of your views on different subjects.

In addition to publication of the best articles in *QST*, the author whose article appears to have greatest value of those received for consideration, has his choice of (1) a copy of *The Radio Amateur's Handbook* bound in leather cloth, (2) six pads of message blanks, or (3) six of the new type A.R.R.L. log books. Our offer is good throughout 1931. The article presented herewith is the prize-winning article for this month.

— *Communications Manager.*

MOST readers are so eager to pry into the Handbook that all but a few pass up one of the biggest things in the book, the Amateur Code, which appears on one of the front pages. And if you happen to be one of those hurry-up-and-get-to-the-middle-of-the-book chaps who have escaped this meaningful bit of philosophy, do yourself one of the biggest favors of your life and look it up now. Surely the ethics of amateur radio have not been more pleasingly and completely stated elsewhere; and with all due respect to the Radio Act of 1927 and all other legal treatises that affect us, I think the soundest advice ever handed out to hams is in the Amateur Code. The substance of hundreds of *QST* articles is concentrated in those six paragraphs, and our hats should go off to Paul M. Segal, from whose pen this masterpiece comes. In answer to the question, "What shall we do to better amateur communication?," I propose that we call general attention to the Amateur Code.

The Old Man might be spared a multitude of words and saved many a heart attack if every amateur adopted the Code as a part of his religion, swearing to live strictly in accordance with its philosophy. Particularly should every ham give attention to the fourth paragraph which reminds us that the real, red-blooded amateur is *balanced*. He never allows amateur radio to interfere with the duties he owes his home, his job, his school, or his community. The balanced amateur does not lead the one-sided life that the public ties up with ham radio. He still finds time to make his interests liberal and broad, though he devotes the greater portion of his energy, when he is at leisure, to his hobby. When he is on the job, his full attention is centered upon his work. He gives his employer the best that is in him. He does not waste time by filling every available piece of office stationery with circuit diagrams, nor does he sit at his desk dreaming of a new crystal-controlled set. He has set aside a certain time to think about, and experiment with amateur radio, and he observes his program. In school he does not neglect his studies for his hobby. He knows that it will do amateur radio no good to provoke warped views from non-amateurs. In his home the balanced amateur is an interesting person. He does not remove himself entirely from his family, and he strives to arouse interest in his hobby. His wife is not made the radio widow, nor is she driven to sacrifice in favor of station upkeep. A station improvement is not permitted to take funds needed elsewhere in the home. In his community the balanced amateur is a man of liberal tastes and interests. He does not neglect the fellow who does not talk radio, nor does he scoff at other hobbies. He does not make a bore of himself by incessantly talking radio but he is on the alert to address any organization in the community on the subject. He is ever-ready to shed the light. QSO's, however interesting, do not keep him from his appointments, though he never disappoints in keeping a schedule. Nor does the good amateur neglect his health in his pursuit of the novel hobby of radio communication. The good amateur is BALANCED. The amateur who is not deserves to be bastinadoed in the presence of the entire League membership or branded with the Amateur Code.

The average amateur is not balanced. His life is one-sided to the point of boredom. He is unpleasantly inclined to grow arrogant and despise the interests of others. In his intolerance he loses the correlation of the sciences and forgets that other artisans are also good citizens. The good amateur keeps abreast of the world's progress. He knows what is going on at home and abroad, as well as being acquainted with the latest radio development.

Read the Amateur Code. Frame a copy and hang it on your wall. Keep it before you at all times. Be balanced — be gentlemanly — be friendly — be everything it says.

*W1AY–W9FZN, 604 E. 51st St., Chicago, Ill.

Traffic Briefs

A Sikorsky plane, the NC-146M, owned by the Pan-American Airways, is on an expedition, inland from São Paulo, Brazil, which will last for about eight months. The 10-watt M.O.P.A. transmitter has been equipped with coils for the 7000- and 14,000-kc. bands so that amateurs may be worked if necessary or desirable. The regular call of the ship is KHFQJ, but possibly on ham frequencies a PY call will be used. Watch for the NC-146M in about the center of the 14- and 7-mc. bands, and coöperate in every way possible.

W8AXV, Ohio RM, reports working WSEA, the submarine *Nautilus*, on April 10th. WSEA was working on 5525-kc. and W8AXV in the 3500-kc. band. More reports are requested on work with the various expeditions now in the field.

BRASS POUNDERS' LEAGUE

Call	Orig.	Del.	Rel.	Total
W3CXL	86	238	2169	2493
W8CMB	210	186	822	1218
W8DDS	315	220	576	1111
KA1HR	315	259	456	1030
W9DZM	417	319	230	966
W6QP	85	87	567	739
W6AWH	15	51	652	708
W6ALU	29	72	584	685
W3CXM	58	107	506	671
W6YG	282	58	322	662
W3NF	105	82	468	655
W6AXM	55	499	100	654
W6ASH	18	39	546	603
W9FFY	58	54	478	590
W8DLG	35	44	497	576
W9DGS	35	49	488	572
W8DYH	72	77	406	555
W9GFL	132	84	333	549
W8GZ	21	58	454	533
W8RN	138	61	310	509
W9DKH	134	22	326	482
W8BAH	302	80	96	478
W9JA	467	4	—	471
W1MK	76	133	254	463
W9QT	120	116	212	448
W3BWT	146	131	168	445
W6HM	147	283	5	435
W6BPW	200	124	102	426
OM1TB	322	56	47	425
W2LU	17	26	374	417
K6DV	368	27	7	402
W5EB	31	21	350	402
W8BYD	136	54	210	400
W5BMI	72	102	196	370
W1CJD	74	46	248	368
W9EYH	18	9	334	361
VE3GT	81	65	203	349
W8DSS	31	19	296	346
W8DFE	13	38	292	343
W8DES	69	30	243	342
W8CLL	5	12	324	341
KA1CE	70	60	208	338
W8AYM	63	58	216	337
W6AOA	96	12	226	334
W8DU	72	116	142	330
W8PP	80	28	221	329
W6EGK	47	87	188	322
W3GX	152	40	130	322
W8CKX	59	55	206	320
W5AHI	5	11	296	312
W3MC	52	110	142	304
W5IQ	101	101	102	304
W7RT	131	148	16	295
W3ZF	117	7	168	292
W7AAT	26	18	246	290
W9HK	55	17	218	290
W6AKW	56	43	184	283
W3LC	47	5	225	277
W6TM	30	73	172	275
VE1DR	—	—	272	272
W1UE	52	84	133	269
K6COG	92	98	70	260
K6AJA	148	19	92	259
W5ABI	74	62	120	256
W6EKE	52	148	54	254
W9BNT	63	49	142	254
W2SC	70	84	98	252
W5AMC	74	70	106	250
W8AM	44	43	162	249
W9ESA	7	14	222	243
W8BMG	22	40	180	242
W8CFI	90	68	82	240
W6EKC	41	34	162	237
W9BJA	36	42	154	232
W9DKL	26	11	194	231
W1IP	22	23	184	229
W38M	69	41	116	226
W8YA	99	40	87	226
W9DTM	42	18	166	226
W9ESU	35	11	180	226
W9DRG	95	100	30	225
KA1JR	38	47	140	225
W2BJA	30	30	160	220
W6AJP	26	44	148	218
W6ETJ	32	87	94	213
W1ASY	77	33	102	212
W9OX	70	40	98	208
W6CH	6	35	166	207
W9NP	15	162	28	205
W9UM	107	64	34	205
W6DQH	23	24	158	205
W6CXT	75	14	116	205
W9GJS	58	27	119	204
W6DPJ	12	56	135	203
W8BSE	54	47	102	203
W9LH	119	26	58	203
VE3ZZ	15	19	169	203
W9CKG	13	46	141	200
W9COS	54	51	90	195
W6DQV	38	84	62	184
W1ZY	62	54	64	180
K4KD	90	88	—	178
W3AKB	22	66	90	178
W1ASF	48	127	2	177
W8BHK	38	50	86	174
W7BB	16	51	102	169
W9BN	62	77	28	167
W6UO	58	51	50	159
W6AMM	34	120	2	156
W8DFR	80	68	8	156
W8UW	50	51	54	155
W8BJ	45	53	55	153
W9FHU	61	75	14	150
W6ABB	17	71	60	148
W6AM	65	71	12	148
W3BLU	20	110	4	143
W1LQ	19	57	66	142
W6DFR	33	50	50	133
W9CFT	69	61	—	130
W7AIT	46	50	34	130
W8CMP	75	52	—	127
W9ERU	16	87	23	126
W8AXV	33	54	34	121
W5MS	50	60	10	120
VE2AC	19	63	14	96
W8CPB	35	55	4	94

All these stations appearing in the Brass Pounders' League are noted for their consistent schedule-keeping and dependable message-handling work in amateur radio. Special credit should be given to the following stations in the order listed responsible for *over one hundred deliveries* in the message month: W6AXM, W9DZM, W6HM, KA1HR, W3CXL, W8DDS, W8CMB, W9NP, W7RT, W6EKE, W1MK, W3BWT, W1ASF, W6BPW, W6AMM, W9QT, W8DU, W3MC, W3BLU, W3CXM, W5BMI, W5IQ, W9DRG.

Deliveries count! A total of 200 or more bona fide messages handled and counted in accordance with A.R.R.L. practice, or just 50 or more *deliveries* will put you in line for a place in the B.P.L. Why not make more schedules with the reliable stations you hear and take steps to handle the traffic that will qualify *you* for B.P.L. membership also?

Traffic Summaries

(MARCH–APRIL)

Central led by Ohio	18881
Pacific led by Los Angeles	14360
Atlantic led by Eastern Pennsylvania	11899
New England led by Connecticut	5205
Midwest led by Kansas	4785
Northwestern led by Washington	3717
Dakota led by Southern Minnesota	3142
Delta led by Arkansas	2547
Hudson led by Eastern New York	2341
Roanoke led by Virginia	1706
West Gulf led by Oklahoma	1672
Southeastern led by Georgia-South Carolina-Cuba-Isle of Pines-Porto Rico-Virgin Islands	1249
Rocky Mountain led by Colorado	835
Ontario	798
Quebec	383
Maritime	374
Prairie led by Saskatchewan	180
Vanalta led by British Columbia	171

1106 stations originated 18,396; delivered 15,741; relayed 40,108; total 74,245. (85.8% del.)

OHIO holds her own with *7109*, and carries the Banner for the third consecutive month! FB. Michigan made a good stab for the honors with 4429, followed by Los Angeles, 3481; Eastern Pennsylvania, 3409; and Md.-Del.-D.C., 3201. The summary above shows the standing of each Division and the highest ranking section in that division — how does your Section stand?

W1MK Operation

A.R.R.L. Headquarters Station W1MK now operates on frequencies of 14,004 kc., 7002 kc., and 3960 kc. in addition to the well-known 3575 and 7150 kc. channels.

Attention is called to the use of the various frequencies for Broadcasts and General Operating Periods outlined in the table shown below. A frequency of 14,300 kc. is also available for use.

It will also be noticed that in order that the time of the Official Broadcasts will not conflict with the Standard Frequency transmissions from W1XP, W9XAN and W6XK, the hour of the early evening broadcasts on Fridays has been changed to 7:30 instead of 8:00 as on other evenings.

The schedule for Official and Special Broadcasts, and General Operating Periods is printed below. *General Operation* periods have been arranged to allow every one a chance to communicate with A.R.R.L. Headquarters. These general periods have been arranged so that they usually follow an *official* broadcast. In all cases the time shown is Eastern Standard.

SCHEDULES are kept with the following stations through any of which traffic will travel expediently to A.R.R.L. Headquarters, on 3500 kc.: W1ACH, W1ZB, W2JF, W3BWT, VE3GT, W3CXM, W4AJH, W8DLG, VE9AL, W9BCA, W9OX; on 7000 kc.: W4AJH, W4AGR, W5EB and W9ERU.

QSL CARDS for W1MK should be addressed in care of A.R.R.L., 38 La Salle Road, West Hartford, Conn. A complete log of every transmission is made and W1MK is always glad to send any station worked a card, but frequently cards are lost when sent direct to the station at Brainard Field. W1MK QSLs after receipt of card.

W1MK OPERATING SCHEDULE

OFFICIAL AND SPECIAL BROADCASTS

	Time (E.S.T.)	*Frequencies (kc.)*
Sunday	8:00 p.m.	3960– 7150
	Midnight	3575– 7002
Monday	8:00 p.m.	3575–14004
	10:00 p.m.	3575– 7002
Tuesday	8:00 p.m.	3960– 7150
	Midnight	3960– 7150
Thursday	8:00 p.m.	3960– 7150
	Midnight	3960– 7150
Friday	7:30 p.m.	3575–14004
	10:00 p.m.	3575– 7002

GENERAL OPERATING PERIODS

Sunday	8:15– 9:00 p.m.	3960
	10:00–11:00 p.m.	7150
	12:15– 1:00 a.m. (Mon.)	3575
Monday	7:30– 8:00 p.m.	14004
	8:15– 9:00 p.m.	14004
	10:15–11:00 p.m.	7002
	Midnight–1:00 a.m. (Tues.)	7002
Tuesday	8:15– 9:00 p.m.	3960
	10:00–11:00 p.m.	3960
	12:15– 1:00 a.m. (Wed.)	7150
Thursday	8:15– 9:00 p.m.	3960
	10:00–11:00 p.m.	3960
	12:15– 1:00 a.m. (Fri.)	7150
Friday	7:30– 8:00 p.m.	14004
	8:15– 9:00 p.m.	14004
	10:15–11:00 p.m.	7002
	Midnight–1:00 a.m. (Sat.)	7002

ELECTION NOTICES

To all A.R.R.L. Members residing in the Sections listed below:

(The list gives the Sections, closing date for receipt of nominating petitions for Section Manager, the name of the present incumbent and the date of expiration of his term of office.) This notice supersedes previous notices.

In cases where no valid nominating petitions have been received from A.R.R.L. members residing in the different Sections in response to our previous notices, the closing dates for receipt of nominating petitions are set ahead to the dates given herewith. In the absence of nominating petitions from Members of a Section, the present incumbent continues to hold his official position and carry on the work of the Section subject, of course, to the filing of proper nominating petitions and the holding of an election by ballot or as may be necessary. Petitions must be in Hartford on or before noon of the dates specified.

Due to the resignation in the West Virginia Section of the Southeastern Division, nominating petitions are hereby solicited for the office of Section Communications Manager in this Section and the closing date for receipt of nominations at A.R.R.L. Headquarters is herewith specified as noon, June 20, 1931. *Reports*

Section	*Closing Date*	*Present SCM*	*Present Term of Office Ends*
Oregon	May 20, 1931	Wilbur S. Claypool	June 2, 1931
Alaska	June 20, 1931	W. B. Wilson	Mar. 28, 1931
West Virginia	June 20, 1931	D. B. Morris (resigned)	.....
Arizona	June 20, 1931	H. R. Shortman	July 15, 1931
Md.-Del.-D. C.	June 20, 1931	Forrest Calhoun	July 15, 1931
Eastern Massachusetts	Aug. 20, 1931	Miles W. Weeks	Sept. 16, 1931
San Diego	Aug. 20, 1931	Harry A. Ambler	Sept. 16, 1931
Eastern New York	Aug. 20, 1931	Herbert J. Rosenthal	Sept. 16, 1931
British Columbia *	Aug. 20, 1931	J. K. Cavalsky	Sept. 16, 1931
Philippines	Sept. 15, 1931	S. M. Mathes	Sept. 28, 1931

To all A.R.R.L. Members residing in the Sections listed:

1. You are hereby notified that an election for an A.R.R.L. Section Communications Manager, for the next two-year term of office is about to be held in each of these Sections in accordance with the provisions of By-laws, 5, 6, 7, and 8.

2. The elections will take place in the different Sections immediately after the closing date for receipt of nominating petitions as given opposite the different Sections. The Ballots mailed from Headquarters will list the names of all eligible candidates nominated for the position by A.R.R.L. members residing in the Sections concerned.

3. Nominating petitions from the Sections named are hereby solicited. Five or more A.R.R.L. members residing in any Section have the privilege of nominating any member of the League as candidate for Section Manager. The following form for nomination is suggested:

(Place and date)

Communications Manager, A.R.R.L.
38 La Salle Road, West Hartford, Conn.

We, the undersigned members of the A.R.R.L. residing in the .....Section of the.....Division hereby nominate .....as candidate for Section Communications Manager for this Section for the next two-year term of office.

(Five or more signatures of A.R.R.L. members are required.)

The candidates and five or more signers *must* be League members in good standing or the petition will be thrown out as invalid. The complete name, address, and station call of the candidate should be included. All such petitions must be filed at the headquarters office of the League in West Hartford, Conn., by noon of the closing date given for receipt of nominating petitions. There is no limit of the number of petitions that may be filed, but no member shall sign more than one such petition.

4. Members are urged to take initiative immediately, filing petitions for the officials for each Section listed above. This is your opportunity to put the man of your choice in office to carry on the work of the organization in your Section.

— *F. E. Handy, Communications Manager.*

ELECTION RESULTS

Valid petitions nominating a single candidate as Section Manager were filed in a number of Sections on or before the closing dates that had been announced for receipt of such petitions. As provided by our Constitution and By-Laws, when but one candidate is named in one or more valid nominating petitions this candidate shall be declared elected. Accordingly, election certificates have been mailed to the following officials, the term of office starting on the date given.

Western Florida	Edward J. Collins, W4MS	March 20, 1931
Iowa	George D. Hansen, W9FFD	March 20, 1931
Sacramento Valley	Paul S. Farrelle, W6AXM	May 6, 1931

In the Los Angeles Section of the Pacific Division, H. E. Nahmens, W6HT and Harry Felch, W6BEC were nominated. Mr. Nahmens received 85 votes and Mr. Felch 63 votes. Mr. Nahmen's term of office began February 24.

In the Eastern Florida Section of the Southeastern Division, E. M. Winter, W4HY; E. D. Miller, W4QL, and Harvey Chafin, W4AII were nominated. Mr. Winter received 43 votes, Mr. Miller 33 votes and Mr. Chafin 24 votes. Mr. Winter's term of office began March 24.

In the Oklahoma Section of the West Gulf Division, Wm. J. Gentry, W5GF and Norman B. Drake, W5ASQ were nominated. Mr. Gentry received 29 votes and Mr. Drake 22 votes. Mr. Gentry's term of office began March 30.

In the Southern New Jersey Section of the Atlantic Division, Robert Adams, 3rd, W3SM, and Dr. Luther M. Mkitarian, W3ASG were nominated. Mr. Adams received 50 votes and Dr. Mkitarian 18 votes. Mr. Adams' term of office began April 10.

* In Canadian Sections nominating petitions for Section Manager must be addressed to Canadian General Manager, Alex Reid, 169 Logan Ave., St. Lambert, Quebec. To be valid such petitions must be filed with him on or before the closing dates named.

OFFICIAL BROADCASTING STATIONS

(CHANGES AND ADDITIONS)

(Local Standard Time)

W1ZY (3700 kc.) Mon., 10:30 p.m.; Tues., 10:00 p.m.; Wed., 8:00 p.m., 10:30 p.m.; Thurs., 10:00 p.m.; Fri., 10:30 p.m.; Sat., 8:00 p.m.

W2BDJ (7105 kc.) Wed., 10:15 p.m.; Sat., 6:30 p.m.

W4AJH (7200 kc.) Daily except Sun., 1:45 p.m.

W4PM (7266 kc.) Sun., 7:00 p.m.
(3633 kc.) Wed., Fri., 9:00 p.m.

W5ABO (3524 kc.) Sun., 11:00 p.m.
(14,096 kc.)

W5OJ (7025 kc.) Mon., 7:00 p.m.; Tues., 9:00 p.m.; Wed., 7:00 p.m.; Thurs., 9:00 p.m.; Fri., 9:00 p.m.; Sat., 6:30 p.m.; Sun., 9:00 p.m.

W6AKW (7250 kc.) Sun., 8:00 a.m.

W6BIP (7280 kc.) Sat., 8:00 p.m.
(14,050 kc.) Sun., 4:00 p.m.

W6CLS (3660 kc.) Mon., 6:00 a.m. to 7:00 a.m.; Thurs., 7:00 p.m. to 9:00 p.m.; Sun., 7:00 p.m. to 12:00 p.m.

W7ALW (3532 kc.) No regular schedule.
(7064 kc.)

W7PL (7290 kc.) Various times.
(3530 kc.) ('Fone)

W9BJA (1760 kc.) Sun., Thurs., 8:30 p.m.
(3660 kc.) Sun., 7:30 p.m.; Mon., Wed., Sat., 8:00 p.m.
(7140 kc.) Mon., Thurs., Sat., 3:30 p.m.

W8BWP (7160 kc.) Mon., Thurs., Fri., 7:30 p.m.

W9FKE (3500.3 kc.) Mon., Tues., Thurs., 7:00 p.m.

W9FZO (7100 kc.) Mon., Sat., 8:00 p.m.
(14,200 kc.) Sun., 1:00 p.m.

W9SO (7200 kc.) Mon., Wed., Fri., 1:00 p.m.

Traffic Briefs

During a recent telephone company emergency (April 8th) when power service failed in New Hampshire, W1FI, Squantum, Mass., connected with W1IP, Manchester, N. H., and arranged an hourly schedule. W1ATJ, Claremont, N. H., had been heard in the morning so a watch in both the upper and lower parts of the 3500-kc. band was arranged to contact other New Hampshire stations. Finally W1BOR at Lancaster was worked. Also W1IP got through to W1BAC, Claremont, getting data from the local wire chief there concerning road conditions and regarding the pole line that had failed. W1IP was in touch with W1BST, Berlin, at 4:00 p.m. and received further data on the lines which was reported to W1FI in due course. In this particular case of emergency it was not necessary to rush portable emergency power supply and battery charging equipment into New Hampshire. However, plans are being made so that in case of power supply and communication failures in the future, local wire chiefs will at once call upon amateurs to go on the air with word for the proper official reporting the situation and asking any assistance necessary. Local amateurs can facilitate such work by placing their names on file with wire chiefs, local Red Cross and other agencies which might be served in time of emergency.

—·—·—

Every 'phone man should drop a postal to General Radio Company, Cambridge, Mass., requesting a copy of Vol. V. No. 10 (March, 1931) *General Radio Experimenter*. Methods useful in determining the maximum allowable percentage modulation with a given transmitter adjustment, and for showing up maladjustments in modulator, oscillator and amplifier systems are described. This bulletin is sent without charge to interested persons.

Attention is also called to "performance measurements" and the description of a vacuum-tube voltmeter "modulometer," pages 127 and 128 of the new *Radio Amateur's Handbook* which should be studied by every 'phone man who wants to improve the range and quality of his transmitter.

To improve conditions on the 'phone band transmitters should be made more effective. Rock-steady frequency is requirement number one. High percentage modulation is a second necessity. Much of the difficulty and QRM to-day is caused by wabbling frequencies and unnecessary broadness — by heterodynes due to carriers whose range extends far beyond the modulated range of the station due to "shallow" modulation.

—·—·—

The 3500-kc. 'phone of W9EXT, Appleton, Wis., has been heard by several K6 stations!

The operator in charge of VK6MO, Watheroo Magnetic Observatory of the Carnegie Institute, Watheroo, Australia, desires as many reports on their signals as possible from American amateurs to assist in special investigations being made at the Observatory. Any ham who sends a report may depend on a card of acknowledgment, as VK6MO always QSLs.

—·—·—

In addition to the stations mentioned in the New Zealand earthquake story, May *QST*, the following amateurs are also known to have given valuable emergency communication service at the time of the disaster: ZL1FT, ZL2BA, ZL2MH, VK2KZ, ZL3AJ, ZL3AR, ZL3GN, ZL4BA, VK4JU, VK4YG, VK5HG and VK5MB. Many American amateurs were on the job trying to contact the stricken area. The following coöperated in this work: W8BOX, W6AIC, W6ATT, W6CFD, W6DWI, W6EMK, W6EWW, W6GQ, and W6WN. W8BOX contacted ZL4BA and received information regarding the safety of several persons. W6DWI worked ZL3AJ; W6CFD worked VK5HG; and W6GQ worked ZL3GN. In all cases where contact was established much important news came through by amateur radio. The main announcement of the earthquake and fire carried by the press associations on the evening of the disaster was a report furnished by W8BOX.

DIVISIONAL REPORTS

ATLANTIC DIVISION

WESTERN PENNSYLVANIA — SCM, Robert Lloyd, W8CFR — W8DLG worked K6DV on 3.5 mc. W8YA transmitted the complete returns of the Intercollegiate boxing meet. W8CMP visited Washington, Pittsburgh, Erie, and Buffalo radio clubs. W8CEO reports a new ham, W8EPT. W8CUG inquires why more Pittsburghers don't handle traffic. W8AGO is working his high-power amplifier. W8APQ reports a new ham from his factory — W8EOD. W8DGW is lining up schedules. W8DUT has a new ham almost ready for call. W8AJU is hunting for schedules on 7 mc. W8AVY is looking around on 14 mc. W8ARC is using both 7 and 14 mc. W8BSE makes the BPL. W8DXI is a newcomer. W8AYH blew up his filter. W8ASE can't let his transmitter go a month without a change! W8BXG says the weather is fine for travel. W8BTQ has a junior op. W8DFA and W8BVV are working on new transmitters. W8DYL is still trying to build a good transmitter. W8CFR is full of hope.

Traffic: W8DLG 576, W8YA 226, W8CMP 127, W8CEO 91, W8CUG 67, W8AGO 62, W8APQ 45, W8DGW 33, W8DUT 22, W8AJU 17, W8AVY 4, W8BSE 203, W8DXI 48, W8AYH 5, W8ASE 3.

MARYLAND-DELAWARE-DISTRICT OF COLUMBIA — SCM, Forrest Calhoun, W3BBW — Maryland: W3AOO, was QSO ZL2BE on 3.5 mc. W3AFF let his license expire but is OK now. W3WF is experimenting with audio amplifiers: W3BGV is making some changes. W3ZK ran up a nice total in the International test. W3BBW is building a 'phone rig for Official Broadcast work; was visited by W2CRY. W3ED has been QRL with school work. W3NY landed his first VK. W3TQ has been having trouble with his new rig. W3BR did some nice work during a snow storm on the eastern shore by contacting W3VT at Salisbury, Md. District of Columbia: W3CXL was the first to QSO with Nicaragua following the Quake. W3CAB, W3BAT, W3APJ and W3PN also deserve many thanks for their fine work in establishing communication with the stricken zone also. W3BWT had several visitors: W3ATW, W3BGW, W9CER, and W2BAD. W3BWL is a new ORS. Delaware: W3AJH worked 34 foreign stations in two weeks on 14 mc. W3ALQ complains of too much QRM on 3500-kc. 'phone band. W3HC has been doing some fine work in traffic handling.

Traffic: W3CXL 2493, W3BWT 445, W3BAT 115, W3HC 45, W3AOO 34, W3AFF 29, W3ZK 24, W3ALQ 6, W3BBW 9, W3ED 1.

SOUTHERN NEW JERSEY — SCM, Robert Adams, 3rd, W3SM — Greetings from your new SCM and thanks for electing me. W3ASG participated in the Army-Amateur

QSO party. W3AWV has new transmitter. W3NK had nice total. W3BEI built MOPA. W3ANP has two type '52s in push-pull. W3BAQ has new 'phone. W3JL kept several schedules. W3ZI manages to keep several schedules. W3BIC is working for ORS. W3BGF worked his first "seven." W3QL can be heard day and night. W3KW keeps regular schedule with South America. Reports from W3ADC, W3AQJ and W3BBD indicate that Salem County is on the job. W3SM has two quarter KW tubes as final amplifiers. The Morris Radio Club will soon have its new club room. The South Jersey Radio Club is having fine meetings.

Traffic: W3ZI 48, W3JL 136, W3BAQ 19, W3ANP 37, W3BEI 12, W3NK 52, W3AWV 17, W3ASG 102, W3BBD 36, W3ATC 20, W3ADC 30, W3AQJ 8, W3KW 69, W3QL 132, W3BGF 30, W3BIC 2, W3SM 226.

WESTERN NEW YORK — SCM, John R. Blum, WSCKC — The Jamestown gang sure are active in traffic work. They have twenty-eight members and publish their own news sheet. W8BIF is crystal controlled. W8BYD makes BPL for the first time. W8ENU, W8EOZ, W8CVH, W8ACK, W8EMN, W8EHL, W8EOZ are new stations in this section. W8DES is back on 3.5 mc. Two new clubs were formed last month — "The Northern Chautauqua Amateur Radio Club" with fifteen members and "The Southern Tier Transmitting Amateurs" with seven members. W8DII was not very active this month. W8BJO is looking for three-way QSOs. W8BIF has crystal control on 3.5 mc. Dr. E. C. Woodruff visited the Buffalo Club this month as the guest of W8CPC. W8DAU and W8BLH are working foreign traffic. W8EET is a new station in Ithaca. W8DCX worked seven new countries this month. W8AYM had a wonderful total. W8AWM is practicing code speed. W8CMW is on 1800-kc. 'phone mostly. The Auburn Naval gang have their new uniforms and have regular drill and instruction each week. The Syracuse State fair radio operated by the Syracuse gang will be W8EIH. W8CYG has a new crystal rig. W8BYO is active in A.A. network. W8AFM is very successful with his 14-mc. 'phone. W8EJX is old W1CPH and is at school in Ithaca. The Jamestown gang is after the traffic banner for W.N.Y. Can't we help them out?

Traffic: W8BYD 400, W8BIF 19, W8DII 6, W8BJO 34, W8BIF 19, W8CPC 26, W8DHU 10, W8BLH 3, W8CVJ 3, W8DJA 27, W8CKC 1, W8DCX 19, W8AYM 337, W8BFG 21, W8AWM 19, W8DMJ 41, W8ARX 36, W8BJI 2, W8CKI 154, W8DEQ 3, W8CMW 32, W8QB 2, W8CSW 11, W8DME 48, W8BUP 4, W8BHK 174, W8DSP 48, W8DSS 346, W8ADG 5, W8DES 342, W8QL 99, W8CYG 50, W8BYO 49, W8AJ 3, W8BVZ 2, W8AFM 11, W8BR 30, W8DBX 148, W8BHU 11, W8IH 189.

EASTERN PENNSYLVANIA — SCM, Don Lusk, W3ZF — The following traffic men are recent ORS appointees: W8CFI, W3OK and W8AIT. W3EV had hard luck because of construction work and BCLs. W3AKE is doing some fine DX work. W3ABN has a FB 'phone perking. W3OP is now an Official Broadcasting Station. Heavy winds tore down W8AEF's aerial. W3BET is looking for traffic. W3PB is heard every now and then. W8CFI sure met a bunch of hams during his Easter vacation. W3DZ is Secretary of the Western Radio Club. W3AQN has had some trouble with his note being RAC. W3AAD is in line for an ORS. W3OK wants to know why some of the fellows can't keep their schedules. W3MC makes the BPL. W8AIT likes the way W8DUD handles traffic. W8DHT is helping out the "Eastern Penna. Ham News" by handling traffic for W3NF. W3NF is sure trying hard to get a Transcon net lined up. Your report is OK, W3FX, and it makes no difference whether you have ten or ten thousand. W8AWO is fooling with television. W8VD thinks the fishing game is gonna take up some of his time. W3AKB says the Frankford Radio Club just celebrated its first anniversary. W3LC worked all districts on 3500 kc. W3ADE called W3ZF over long DX 'phone and had a nice chat. W8EU reports W8EIX, an op. at WRAK, on the air. W8CWO now has a new crystal perking. W3MG has been handling a large amount of traffic. WCQV is certainly doing his bit for the Naval Reserve. W3AQQ is still busy with school plays. W3UX is trying out 14 mc. W3GX is the U.S.N.R. headquarters station. W3BCF reports. W3AVI forgot to report last month. On June 13th there will be a Hamfest and banquet at the Walt Whitman Hotel in Camden, N. J. Everyone is urged to come and bring a friend. Tickets will be between $2.50 and $3.00 but that's more than cheap for the amount of fun you get.

Traffic: W3AVI 13, W3GX 322, W3UX 111, W3AQQ 10, W3QV 17, W3MG 168, W8CWO 62, W3LC 277, W3ADE 9, W3AKB 178, W8VD 127, W8AWO 13, W3FX 11, W3NF 655, W8DHT 43, W8AIT 36, W3MC 304, W3OK 96, W3AAD 113, W3AQN 44, W3DZ 43, W8CFI 240, W3PB 18, W3BET 65, W8AEF 13, W3OP 37, W3EV 92, W3ZF 292.

CENTRAL DIVISION

OHIO — SCM, Harry A. Tummonds, W8BAH — Two banners in a row for OHIO! Some more good news too; we now have 81 stations reporting. "In OHIO all ORS report regularly and on time." W8CMB, W8DDS, W8GZ, W8RN, W8BAH, W8DU, W8CKX, W8DFR, W8UW and W8AXV made the BPL. Have you heard W8CMB's new 1 kw. on 7 mc.? W8DDS is plenty busy with his many jobs. W8GZ is completely snowed under with 8 pounds of Questionnaires. W8DU is RM for Southern Ohio. W8AXV, RM for 7-mc. band, has a regular schedule with W8EA. We will lose W8RN soon as he will be on KGOI. W8CKX, W8BNC, W8CSB, W8AND, W8EEQ, W8CUR are new ORS. W8BAH has a brand new Radio shack. W8UW has some good schedules. Regular schedules put W8DFR in the BPL. W8BMX is working in Ashtabula. W8FA spent Easter at W9RS. W8LI reports new ham in Akron, W8DVE. W8ADS handled OHIO Northern U schedules. W8CEI had a good total. W8BTT holds U.S.N.R. schedules. W8CFT says "FB on the banner." W8US is the Cleveland Unit U.S.N.R. station. W8EB has 14 schedules. W8CIY says things kind of serious. W8CX has moved to 400 Norwood Ave., Youngstown. W8EHO is a new ham in Cleveland. W8ATV has cancelled all schedules. W8CDW will be an ORS soon. W8CK is busy on the farm. W8BAQ is a new ham in Findlay. We are glad to have W8CCK back on the job. He reports new ham, W8AOB, in Ravenna. W8CS8 is rebuilding. W2BMX, who operates W8SG, wants the gang to look for him as soon as school is out. Here's hoping that W8DMK will be an ORS soon. W8HH don't know whether or not the new set is better than the old one. W8DGS holds a daily schedule with W8DDS. W8DUD will be off air for a while. W8BSR worked five new countries during contest. W8DMX handled Red Cross messages. W8MH has new daily schedule with W8DDS. W8CUL handles all his traffic on 'phone. W8EJ is busy on police radio in Youngstown. New ham in Findlay, W8BAD. W8NP is using a Type '52. W8BAC says BRS2 reported his 'phone. W8DBK will have a summer schedule with W8FA. W8DZH will have daily schedule with Cleveland. W8CWC will be an ORS by next report. W8OQ blew his rectifier tubes. W8KP, W8AQX, W8AQH, W8EFG, W8DXD and W8EEW are new reporters. W8AZU is putting in remote control. W8BKM has moved to 833½ W. Main St., Conneaut. W8ARW is on 'phone. W8CWA reports ready for schedules. W8TK, W8AYF, W8CNM, W8BDU, W8DIH, W8AIR, W8ALG and W8BCI all turn in good reports. W8BYG says everything same as usual. W8VP is starting a new radio club called Cambridge Amateur Radio Operators. W8BZB reports every one sick with the flu. W8DPF reported 75 total with one Type '01A. W8APC sends in a good report. W8EBT operates at W8US. W8BBH says better luck next month. W8UC represents Hams Limited of Cleveland. W8BZL hasn't recovered from the AKRON Ham fest yet. W8JR is an old-timer from 1916. M. Fay McDowell reports from O.S.U. having held Ex-W8IK, W8EC and W8SG. W8DCJ, W8AOJ and W8AZG are rebuilding. W8ALG reports the new club at Newark; Pres., W8CFJ; V.-Pres., W8EON; Sec., W8ALG; Treas., W8BBD. The club is called "The Moundbuilders Radio Club." Here's another new club station, W8EGO, the Lakewood Radio Club, Lakewood. Visitors welcome. Meetings every Friday.

Traffic: W8CMB 1218, W8DDS 1111, W8GZ 533, W8RN 509, W8BAH 478, W8DU 330, W8CKX 320, W8DFR 156, W8UW 155, W8AXV 121, W8ATV 114, W8SG 111, W8CEI 105, W8CWC 97, W8VP 91, W8CSB 84, W8BZB 80, W8DPF 75, W8EJ 69, W8MH 68, W8CGS

66, W8BNC 61, W8NP 50, W8BAC 58, W8BTT 57, W8DMX 53, W8ADS 52, W8AQH 44, W8BBH 44, W8HH 43, W8EB 42, W8CCK 40, W8AIR 40, W8CFT 36, W8AQX 36, W8ALG 35, W8CDW 34, W8DMK 33, W8DUD 31, W8BKM 31, W8DCJ 27, W8BYG 24, W8CUL 23, W8TK 22, W8AND 22, W8DBK 19, W8US 18, W8UC 17, W8JR 16, W8BDU 16, W8CK 16, W8CSS 16, W8BSR 15, W8APC 14, W8DIH 13, W8ARW 15, W8EFG 8, W8OQ 8, W8BMX 8, W8AOJ 8, W8AWS 12, W8KP 7, W8FA 7, W8CIY 6, W8EGO 6, W8BZL 6, W8EEW 5, W8EBT 3, W8DXD 2, W8CX 2, W8AZU 2, W8DZH 2, W8LI 2, W8EEQ 1, W8CWA 1.

KENTUCKY — SCM, J. B. Wathen, III, W9BAZ — Three Kentuckians land in the BPL this month. W9QT leads as usual, with W9OX closely followed by W9LH. If the month had been a little longer, W9ALR would have gotten up there too. W9AQV has his crystal perking. W9OX took a week off to build his up pretty. When is W9JL going to put crystal in front of their rockcrusher? W9CEE reported by special delivery. FB! Why don't W9CNE and W9EQO put some news on their report cards? W9BWJ has a new antenna working on 7130 kc. W9BEW now has an a.c. receiver. W9ARU rebuilding for crystal. Adding filament by-pass condensers helped W9EDQ's TNT ckt. W9FZV has spring fever, but maybe it's love. W9BXK requests to be placed on inactive list for a while. Hurry back, Wixie. W9ERH has a brand new YL Junior opr. Many happy returns! W9FQQ has a new a.c. receiver. W9AZY is keeping W9BAZ's crystal warm for him. A new antenna worries W9DDQ's neighbors. W9EYW is building a combined 'phone and c.w. set. W9GGB reports two new hams in Danville. W9AEN replaced power-pack with MG. W9CDA took a message from Wilkins sub for W1MK. W9BAZ gets plenty breeze perched atop his 85 footer. The RI is a trifle slow renewing W9BAN's licenses. W9ELL loses ORS tag for not reporting. W9ABG dug up $2.50 and is with us once more. W9BBO changed QRA and rebuilt. W9EQM reports YLs more attractive than radio. W9DQC is building a 'phone now.

Traffic: W9QT 448, W9OX 208, W9LH 203, W9ALR 169, W9AQV 100, W9JL 86, W9CEE 68, W9EQO 37, W9BWJ 33, W9BEW 30, W9CNE 29, W9ARU 22, W9BAZ 21, W9EDQ 20, W9FZV 16, W9BXK 14, W9ERH 9, W9FQQ 7, W9AZY 5, W9DDQ 3, W9EYW 3, W9GGB 3, W9AEN 2, W9CDA 2.

MICHIGAN — SCM, Ralph J. Stephenson, W8DMS — W8DYH and W8FX will fix you up with a schedule for any hour, and any day. W8DYH heads the list again with 555 messages. W8BMG was a Detroit visitor recently. W8DDO is wasting a lot of good air playing tennis. W8CPB is teaching a radio class at the Capac "Y." Our QSL printers, W8CUX and W8DED, report business good. W8DSF had to get another license (marriage). W9HK is working hard keeping the gang lined up in the upper peninsula. W9GKR finds time to handle traffic when he gets fed up on 'phone. W9FPF and W9DYH QRL school. W9CE put a message into China via W6AHK in an hour. W8DXY is acting as surplus junk clearing house. W8BG will QSP any time, day or night. W8BTK is pulling in the sigs with an a.c. receiver now. W8AM lost about 38 cycles when he put in the MOPA and was reported "stedi 22 cycle a.c., xtal." W9AXE is experimenting with MOPA. W9GJX kept her schedules from W9VL. W8AJC is pitching them out with MOPA. W8AGJ is coming on with a 211. W8DFE brothers are trying to ward off an attack of "baseballitis." W9CSI takes the "rebuilding" championship away from W8CAT. W8PP reports ham interest high in Monroe. W8JX been QRL with A. T. & T. cable failures. W8BRS makes Detroit deliveries by 'phone. W8DNT and W8CWK find time to handle a few. W8DMR comes up with a nice total. W8BPT is moving to Chicago. Hate to lose you, Lillian. W8FX is gonna get a 2nd op. W8DED is working hard to put the Grand Rapids hamfest over. W8BXJ is moving to Detroit. W8COQ QRL at WASH. W8BJ's list bears out his statement that the old outfit is still perking. W8SH is hoping that his sick, soft and downhearted 250 watter will last a while longer. W8DMS has a mercury arc perking W8VL is kept busy putting in new filter condensers. W8DZ adds a postscript to his report that W8DYH was at the key. W9EGF is visiting Duluth hams. W8DJQ is going to eliminate operators with his radio typewriter. For reliable schedules QSO or QSL the Route Managers. W8DYH for Detroit and Eastern half of Mich., W8DED for Western half Mich. and W9GJX for the Northern Peninsula.

Traffic: W8DYH 555, W8DFE 343, W8CLL 341, W8PP 329, W9HK 290, W8AM 249, W8BMG 242, W9CE 170, W8BJ 153, W8DMR 151, W8BBX 111, W9GJX 110, W8DXY 110, W8CWK 103, W8CPB 94, W8DED 92, W8AKN 81, W9GKR 72, W8DA 69, W8GP 68, W8BPT 65, W8BXJ 59, W8CFZ 56, W8WG 54, W8DZ 51, W8FX 52, W8BTK 44, W8CAT 43, W9CSI 36, W9VL 36, W9DYH 35, W8MV 32, W8BG 19, W9AXE 16, W8WR 11, W8BGY 11, W8CJZ 11, W9EGF 11, W8CKZ 10, W8DNT 9, W8VL 9, W8BRS 8, W8DDO 6, W8JX 5, W8COQ 4, W8SH 3.

INDIANA — SCM, George Graue, W9BKJ — About 35 League members gathered at Elkhart for the first hamfest of this year. Mishawaka has plans well under way for another hamfest for late in May or early June. W9ESU leads the parade with W9UM and W9GJS as close seconds. W9ADW is a new ham at Mitchell. Fire destroyed W9CLR some time ago but he has rebuilt. W9CKG has a new MOPA. W9AMI is going to school to try for a yellow ticket. W9DHJ isn't very successful in finding reliable schedules. W9DDB is using W9YB for the OBS since W9DDB was destroyed by fire. W9AIP is rebuilding once more. W4VK is attending Purdue Univ. and has the call W9DZJ. W9EGE is back again. W9AIN is back in Indiana and operating at WKBF. W9FRY is having trouble with a Zepp. W9CMQ is putting up new masts. W9BZZ is on the sick list. W9FKE has added more power to his 'phone. W9GYB is a new station in Richmond. W9FXM has complete new station. W9EPH is QRL. W9BHM reports the arrival of a Jr. Op. W9EFV is rebuilding entire outfit. W9GGJ hasn't produced that promised DC note. W9DWL and W9BKJ have a super het nearly working. W9BZF is trying to get a 'phone to work. W9AEB will try his luck on a new Zepp. W9CHA is the latest addition to the ORS family. W9BWI wonders why the 'phone doesn't get out. W9AAI has a new power supply. W9CVX is the new op. at WOWO. W9COI is back from Arizona. W9AXI is QRL with a night job.

Traffic: W9ESU 226, W9UM 205, W9GJS 204, W9CKG 200, W9AMI 77, W9DHJ 49, W9RW 20, W9FZO 40, W9YB 92, W9GJG 24, W9AIP 18, W9DZJ 11, W9EGE 10, W9FYB 9, W9FXM 3, W9FKE 8, W9EPH 4, W9FRY 3, W9EFV 4, W9GGJ 6, W9BKJ 43, W9ETH 21, W9AAI 63, W9BHM 34.

WISCONSIN — SCM, C. N. Crapo, W9VD — W9GFL piled up his highest total this month. W9DKH's first report looks like he means business. W9EYH finished a close third. W9FHU will soon have two 50 watters. W9CFT has schedules with W9FHU and W9FGX. W9FAW has been after DX lately. W9BWZ is keeping things moving. W9DTM is now operating at WSIX. W9FAA hasn't been doing much lately. W9DIT says things are not so hot. W9EBO reports working 41 countries during the past eight months. W9LV was heard in New Zealand on 3.5 mc. W9FSS schedules W9GFL and W9GMZ. W9ABM has Vitaphone silent hours. W9EIK is on 3.5 and 7 mc. daily. W9BIB is active in the Army net. W9ESZ is a commercial fisherman. W9OT is making up a list of rotten notes. W9EPJ is waiting for a renewal of his license. W9VD has been busy on his new job.

Traffic: W9GFL 549, W9DKH 482, W9EYH 361, W9FHU 150, W9CFT 130, W9FAW 122, W9BWZ 83, W9FAA 45, W9DIT 37, W9EBO 32, W9LV 20, W9FSS 19, W9ABM 14, W9EIK 9, W9BIB 8, W9ESZ 3, W9OT 2, W9EPJ 2, W9VD 12.

ILLINOIS — SCM, F. J. Hinds, W9APY — W9DZM turns in his usual splendid total. W9ERU worked 12 countries this month. W9AGV works DX on 14 mc. W9FFQ has worked five DX countries. W9BNO has a new receiver. The only fellows W9GKI can work seem to be PY's. W9CNY did all his traffic work on two schedules. W9EAL is helping a few new boys get started. A new MOPA is being installed at W9CTP. Ex-W9DJ is now W9GSY. W9GMT is building a low-power push-pull transmitter. W9GJI uses 250 watter on 3.5 mc. W9ECR has changed QRA's. W9DZU says traffic is scarce. W9ACR's crystal smashed up. W9ADZ

is trying out 'phone. W9AWL is on 3500-kc. 'phone. W9DZG has a new SG tuned RF receiver. A new ham is on in E. St. Louis with the call W9GSS. W9EBX is building a push-pull Hartley. W9BPN is now to be found on 14 mc. W9BLL improved his signals 100% with a brand new 3500-kc. Zepp. W9DJG and W9CMC are both on 7 mc. W9FGN reports traffic scarce on 7000 kc. W9ACU is President of the Illinois Valley Radio Club. W9QI is Vice-President and Secretary. W9CGC is now using a 211-D. W9BYL has receiver troubles. W9ALA is now working both 7 and 3.5 mc. W9ACE, W9BYL, W9ERU and W9APY are starting an Illinois state traffic net. W9ATS has a portable call, W9GTQ. W9CUX has a DeForest 510 coming. W9GAI is Illinois' latest ORS. W9GAI is building an MOPA for 'phone. W9ENH was late with report so sent it direct to Hqs. W9CUH is trying hard to get the crystal outfit going. W9BZO is planning a 14-mc. 'phone set. W9FCW met a visiting lodge brother and soon found out it was W9AMO. W9KB is planning a crystal transmitter. W9GFU is building a dynatron. W9DBE has a new 'phone. W9ET has a new MOPA. W9BVP has improved conditions with remote control. W9FPN has a new crystal. W9FGG is on with a 7½ watt crystal. W9DKF tried MOPA. W9FI likes the new big card of HH7C. W9KA's 50 watter went west. W9FGD reports DX good on 7 and 14 mc. W9PK keeps schedules with KFU2. W9BRY reports four old hams starting up again. They are W9AQD, W9BQF, W9BRO and W9DQR. W9BRX states that 14 mc. has been better this past month than for the last six years. W9AFN says traffic and DX do not mix. New doublet at W9CZL. W9CKZ reports a new ham — W9GOK. DX poor at W9FXE. A painting spree is on at W9BIR. Push-pull '10 tubes are working overtime at W9EMN. W9BSR took message from a W6 to Chicago and answer back in 10 minutes. W9FO is looking for a new QRA. A new crystal-controlled set is very FB at W9QI. W9GSS is a new station in E. St. Louis. W9MI had 74 message contacts in the International Contest.

Traffic: W9DZM 966, W9ALA 194, W9ERU 126, W9CUX 104, W9FGD 100, W9CNY 95, W9ERZ 58, W9AMO 47, W9BNI 45, W9ENH 45, W9AD 39, W9CZL 35, W9ACE 33, W9LL 33, W9DBE 31, W9AFN 28, W9ET 27, W9ACU 23, W9GAI 23, W9KA 23, W9ATS 21, W9CGC 20, W9CTP 19, W9BRY 18, W9DKF 18, W9FXE 17, W9BIR 15, W9BYL 14, W9FCW 12, W9BSR 10, W9FVO 10, W9KB 10, W9PK 10, W9FGN 9, W9QI 9, W9AFB 8, W9CKZ 8, W9FTX 8, W9FI 7, W9GFU 6, W9BRX 5, W9DZG 5, W9APY 3, W9ECR 3, W9EMN 3, W9MI 4, W9BVP 1 W9DZU 2, W9FPN 1.

DAKOTA DIVISION

NORTHERN MINNESOTA — SCM, Ray H. Weihe, W9CTW — The Arrowhead Banquet went over better than ever, and the gang at the club must be congratulated. W9BRA leads the section this month. W9BVH reports DX very FB. W9BBL plays in a dance band. W9BHH took a bunch of traffic from NN7XJ. W9EGU was getting lined up for Directors' meeting. W9CTW experiments with recording. W9FNJ is heard in England. W9DOQ kicks over some real DX. W9EOZ will be out for ORS in fall. W9FNQ comes through with a nice signal. W9EHK is a new reporter. W9GGQ got W9COO on the air. W9FFL reports conditions tough on 7 mc. W9EHI blew his filter. W9CWI sends out over 100 "OO" cards every month.

Traffic: W9BRA 127, W9BVH 47, W9BBL 41, W9BHH 31, W9EGU 24, W9CTN 23, W9FNJ 17, W9DOQ 14, W9EOZ 12, W9FNQ 12, W9EHK 11, W9GGQ 12, W9FFL 9, W9EHI 4, W9CWI 1.

NORTH DAKOTA — SCM, Guy L. Ottinger, W9BVF — W9DGS deserves honorable mention for his fine traffic total. W9EMY, W9FMO and W9GIZ, non-ORS, report. W9FMO is working 'phone on 1980 kc. W9EMY says that ZLs and VKs cause him lots of QRM. W9EGI blew his 30 watter. W9GIZ says W9DOY is an announcer at WDAY. W9CRL handled a nice batch of traffic. W9DM has the rig perking OK now. The SCM still has the self excited 852.

Traffic: W9DGS 572, W9CRL 74, W9BVF 60, W9EGI 30, W9DM 10, W9GIZ 8.

SOUTH DAKOTA — SCM, Howard Cashman, W9DNS — W9DKL takes traffic honors. W9CDW is a new ham in Redfield. W9CFU has a nice wad of schedules. W9FLI had a nice visit at KOIL. W9ALO reports 7W9EUH on 3.5 mc. W9CKT is doing wonders with a type '03A. W9ALO and W9DNS had nice visit.

Traffic: W9DKL 231, W9CFU 92, W9FLI 23, W9CDW 16, W9DNS 15, W9ID 5.

SOUTHERN MINNESOTA — SCM, H. Radloff, W9AIR — W9CH, W9DH, W9AQG, W9CPM, W9BIS, W9BHB, W9BQF, W9AIR, and other Southern Minnesotans attended and enjoyed the Second Annual Banquet and hamfest of the Arrowhead Radio Amateurs held in Duluth April 18th–19th. W9FFY finds the Coast to Coast "QRN CHAIN" very fruitful. W9DRG again sells out. W9COS says early daylite is wrecking schedules. W9BN is Net Control in the AARS. W9BKX plans on a number of hamfests. W9AIR is getting steamed up for U.S.N.R. cruise. W9BTW-W9ELA have good luck in DX. W9FNK is now OBS. W9CH has an ultra-compact portable receiver. W9BNN says spring zephyrs stretched his 7 mc. antenna to 3.5 mc. fundamental. W9DGE has a sw set with him on the barge. W9FJK uses a Breather cell on his 2-volt tubes. W9EYS plans a trip to the Orient. W9EFJ is active in the A.A.R.S. W9AKN reports good DX on 14 mc. W9FPY reports the Luverne gang pepping up. W9FJI is using type '45a. W9BNF has new a.c. receiver. W9DOP operated during vacation. W9GBZ has 'phone on 1.7 mc. W9FAJ has a neat layout. W9FAD likes his super-het converter. W9CKU enjoyed hamfest with the Sioux City gang. W9FLE reports a visit by the Heron Lake fellows. W9EAT is getting a new crystal. W9FDX wound a power transformer with 26 taps. W9DWG gets good range with lo-pwr. on 3.5 mc. W9BKK gets under way with a modern station. W9FMB has been running experiments with W9TF. W9EYL feels spring fever coming on. W9GHO is QRL with orchestra. W9BFV is married. W9EEB aspires to a commercial ticket. W9GMD has 750 volts on a type '10. W9CPM admits an ambition to earn WAC on 14-mc. 'phone. W9EFK spent all of his time in experimenting.

Traffic: W9FFY 590, W9DRG 225, W9COS 195, W9BN 167, W9BKX 106, W9AIR 93, W9BTW 56, W9FNK 56, W9EYS 20, W9CH 16, W9BNN 13, W9DGE 9, W9FJK 6, W9EFJ 6, W9AKN 4, W9FPY 1, W9CPM 58.

DELTA DIVISION

TENNESSEE — SCM, James B. Witt, W4SP — W4VK is on the air with call W9DZJ. W4ABR says DX is FB on 14 mc. Tennessee led the whole 4th CA in the number of stations handling the RED CROSS MESSAGE. W4CW has been on 14 mc. W4AFM is our new RM for East Tenn. W4HK is on with a new crystal rig. W4FD also has new transmitter.

Traffic: W4AFM 110, W4OI 96, W4AAD 46, W4FR 40, W4CW 23, W4RO 11, W4AAO 10, W4AGW 4, W4KJ 4, W4ABQ 6, W4AHR 3, W4APO 1, W4AOI 2, W4ABR 1, W4SP 3.

MISSISSIPPI — SCM, William G. Bodker, W5AZV — W5BTL and W5ANP report. W5AWP is recovering from illness. W5ANX is a new station at Pickens. W5AZV worked China, France and Australia. The SCM visited W5BUI at Vicksburg and W5ID at Canton. W5AMZ is a new station in Jackson. W5BNW is getting out FB on 14 mc. W5VJ may be seen on his roof most any afternoon cutting pieces off his Hertz antenna. The following 3.5 mc. stations are coöperating with the Army Amateur System: W5VJ, W5AWP, W5ANP and W5AZV. The Jackson Amateur Radio Assn. invites any transient hams to visit the new clubroom on the 20th story of the new Tower Bldg. Meetings held every Saturday night. W5BTL has recently moved to Gulfport from the 9th Dist.

Traffic: W5BUI 31, W5AZV 58, W5AWP 24, W5BNW 28.

ARKANSAS — SCM, H. E. Velte, W5ABI — W5BMI seems to be our regular BANNER STATION. W5IQ is getting along fine with the A.A. network. W5HN is again going strong. W5BRI has a new 5-tube a.c. receiver. W5BKB has been trying for DX on 14 mc. W5AGB is using a type '45 tube with 350 volts. W5BLG had to tear down and move. We welcome back another old timer, W5PX. W5ABI would like to work all the stations in Arkansas.

W5SI has been busy enlisting men into the Naval Communication Reserve at Pine Bluff. W5AAJ reports everything OK. W5DD is having a little trouble with his crystal 'phone set. If your station is not listed in this report it is because the SCM did not receive a report from you. Let's hear from you all next month.

Traffic: W5BMI 370, W5IQ 304, W5ABI 256, W5BRI 93, W5SI 52, W5HN 37, W5AAJ 35, W5BLG 29, W5BKB 22, W5AGB 10.

LOUISIANA — SCM, Frank Watts, Jr., W5WF — W5BUK turns in his first report. W5ACY is QRL selling Coca-Cola. W5AIB is a new ham in Shreveport. W5RR can't let DX alone. W5KC made 100% on his Post Office examination. W5EB was up to the meeting April 18th. Ditto for W5BHV and W5WG. W5YW has a nice pee-wee signal on 7 mc. W5BJA says he worked Mars. W5BFP is QRL from 'phone calls from the YLs. W5AXD is installing crystal 'phone. W5ANQ worked a K6. W5AXU worked a VK. W5WF has been working F, VK, ZL and LU on 7 mc. W5NJ gave us a welcomed relief from his a.c. by installing d.c. W5BKL QRT till the RI receives and returns a license to him. On April 18th a group of north Louisiana amateurs met at the home of Mr. R. A. Crain, W5RR, for the purpose of a meeting with the Director of the Delta Division, Mr. M. M. Hill, W5EB. Those present were W5BHV, W5AIB, W5WG, W5BJA, and the entire staff of W5WF together with R. A. Jr. and Sr. of W5RR. During the course of the meeting a Radio Club was organized with Frank Watts, Jr., W5WF, as President and Bill Morgan W5BJA as Secretary-Treasurer.

Traffic: W5EB 402, W5YW 128, W5ANQ 68, W5WF 63, W5ACY 61, W5RR 16, W5BUK 68, W5AXU 7, W5BJA 1, W5KC 4, W5AJV 20.

HUDSON DIVISION

NEW YORK CITY AND LONG ISLAND — Acting SCM, Wm. J. Warringer, W2BPQ — Due to the press of business Vin Kenney, W2BGO, has been forced to relinquish his position of SCM. He wishes to thank the gang for their coöperation in the past and hopes they will coöperate with W2BPQ in the same manner. House cleaning being in order the following ORS have been cancelled for failure to report for three or more months: W2AII, W2OV, W2BCB, and W2ARQ. Reports from the 'phone gang, handling traffic or not are desired. Please send all reports in future to the Act. SCM at 767 East 137th St., N. Y. City. Manhattan: W2SC as usual leads the pack. W2BNL reports much work at N.B.C. W2BDJ's bogey man (key clicks) is on the job again. W2AVK is now located at 500 Ft. Washington Ave., N. Y. City. W2AOY desires help from a crystal expert. W2CKS announces the arrival of a 7½-lb. brass pounder on Friday, the 13th!! Brooklyn: W2PF and W2BO tied for traffic honors. W2PF reports W2CHU is back in N. Y. after two years in far east. W2BO's new AC receiver makes DX sound like locals. W2BIV just opened up another store. W2BJF wants to be an ORS. W2AZV is busy on Hudson Div. Convention Committee. W2APK tells us DAIV is back in town and sends his 73. W2BEV worked F8SM on 3500 kc. W2AOD sends in his first report. Bronx: W2BGO delivered ten messages from Nicaragua the day after the quake. W2CYX desires to hear from any of the gang interested in Naval Reserve. W2LW says every little bit helps. W2BPQ will sign up you in Nat. Guard if not interested in Naval Reserve. Hi. W2FF is experimenting with MOPA. W2AFO dropped down to 14,280 kc. and blew his 50. Interment Harts Island. W2VG and W2BDJ should be twins; have same ills. W2APV is back from three months' vacation in Jamaica, B. W. I. W2CWP says he would get a kick out of seeing his call in *QST*. Long Island: W2AIQ is doing fine work as OO. W2AMT-2AKC will be leaving us shortly as is moving to N. J. Our loss is New Jersey's gain W2AVP-NO invites the gang to visit him at WNYC. W2BDN is lining up some good schedules. W2HO is looking for that L. I. traffic the gang say they can't QSP. W2CHY has joined the Army Net. W2CWJ edits a column in the Freeport L. I. News.

Traffic: Brooklyn — W2PF 49, W2BO 49, W2BIV 45, W2BJF 33, W2AZV 26, W2APK 23, W2BEV 21, W2AOD 8. Manhattan — W2SC 252, W2BNL 2, W2BDJ 2, Bronx — W2BGO 64, W2CYX 44, W2LW 29, W2BPQ 28, W2FF 24, W2AFO 7, W2VG 7, W2APV 5, W2CWP 5. Long Island — W2AIQ 139, W2AMT 30, W2AVP 18, W2BDN 11, W2HO 6.

EASTERN NEW YORK — SCM, H. J. Rosenthal, W2QU — It's beginning to look like no one is ever going to beat W2LU in handling traffic. W2BJA came second this month. He had the pleasure of entertaining VE3GT, who stopped over there on his way to Boston. W2ALI ran up his total by operating at the Boy Scout Exhibition in Poughkeepsie. W2CJP has been forced to drop the organization of a Police Net due to lack of consistent operation. W2BER was the only station in Troy handling traffic. W2CGO managed to work several Aussies. W2ACD is spending most of his time breaking in his new Chevrolet. W2BLU thinks it is much easier to handle traffic than it is to explain the process to the BCL he delivers the messages to. W2BSH is President of the SARA. W2AYK is still trying to contact NDF. W2ACB has been traveling. W2CL has been appointed Official Observer, to work in conjunction with W2AJD. W2CTA has gone down south for a vacation. W2AJD spent very little time on the air this month. W2ATM is the latest ham in New Rochelle.

Traffic: W2LU 417, W2BJA 220, W2ALI 67, W2CJP 52, W2BER 48, W2CGO 44, W2ACD 32, W2BLU 32, W2BSH 23, W2QU 28, W2AYK 15, W2ACB 8, W2CL 4, W2CTA 2, W2AJD 2, W2ATM 9.

NORTHERN NEW JERSEY — SCM, A. G. Wester, Jr., W2WR — W2WR can find no time to operate now that his transmitter is finished. W2JF still works all stations on schedule. W2AOS blew his filter condensers and rectifier tubes. W2CWK has been fooling with receivers. W2AGX has had plenty of fine European contacts. W2CJX had fine contacts with New Zealand. W2BPY is yachting these fine days. W2MQ again hands in the largest traffic total for this section. W2BKE does not find much time to operate. W2CFY gives code practice. W2CDQ has a 1750-kc. 'phone and c.w. rig. W2AIF has been busy with his orchestra. W2CLX is closed down for repairs. W2CZE is an old sea-going op. W2CAE hails from the 7th District. W2CHZ has been on 14 mc. W2BYX is pushing his type '10 pretty hard. W2CNA had contact with W1FN. W2CHB has moved to Summit. W2BPV is a new ham in Englewood. W2ADP, W2BAP and W2BPV try to visit at least one ham each Sunday. W2BJZ worked Hungary on 7 mc.

Traffic: W2JF 69, W2AOS 33, W2CWK 9, W2AGX 3, W2CJX 12, W2BPY 21, W2MQ 155, W2BKE 1, W2CFY 3, W2CDQ 64, W2AIF 10, W2CLX 5, W2CZE 15, W2CAE 1, W2BYX 6, W2CNA 1, W2BJZ 3.

MIDWEST DIVISION

NEBRASKA — SCM, S. C. Wallace, W9FAM — W9FAM wants to thank all the fellows for the support in making the Convention at Grand Island a success. W9EYE is new ORS. W9GDL is going strong. W9CPJ sends in recommendation of W9EHA for ORS. W9DFR is still pounding out good totals. W9EHW and W9FUW are going strong in A.A. work. W9EEW was sorry he did not attend convention. W9DTH is changing QRA. W9DI has nothing to say. W9QY will be inactive this summer. W9BOQ says the old plow needs scouring. W9BNT knocks us all back with a total of 254. W9EWO, W9DHC, W9BQR, W9EQS and W9FWW report. W9DHA is wondering if SCM is on the air after the convention. Yep! W9AZT reports for first time.

Traffic: W9FAM 160, W9EYE 108, W9GDL 53, W9CPJ 94, W9DFR 30, W9EHW 14, W9EEW 11, W9BNT 254, W9EWO 6, W9DHA 7, W9AZT 4, W9FUW 65, W9FWW 47, W9EQS 5, W9DHC 70.

IOWA — SCM, Geo. D. Hansen, W9FFD — The list is topped by W9DTM this period. He is going to W8IX, Greenfield, Tenn. W9ACL reports QRL on new shack. W9EJQ reports QRL business. W9EOP reports new ham, W9GQE, near Hinton. W9BCA keeps busy with U.S.N.R. and A.A.R.S. W9AWY gives us a good report. W9FYC is looking for schedules. W9EIV radios his report. W9IO comes through with a report and request for ORS. W9BJP sends report with promise of larger ones. W9FZO falls short due to lay-off on account of illness. W9AHX is still using the

ole type '45. W9AG reports handling important tracer on message from Hawaii. W9DFZ is building new AC receiver. W9FEB has a new ORS appointment. W9DIB reports International Contest was slow in his locality. W9BPG has new M.O.P.A. about ready. W9ANO reports via the RM. W9ELV returns to the fold. W9CWG, an old timer ORS from 1922, reports no traffic. W9AYC will be on 'phone soon. W9DZW-GP emerges from the pile-up of data contained in his recent questionnaire in time to give us his report. He also sends a report in for W9CZC. W9BFL worked his first VK. W9DNZ manages to get in a lick or two on the A.A.R.S.

Traffic: W9DTM 226, W9FFD 152, W9ACL 145, W9DZW 73, W9EJQ 71, W9EOP 66, W9BCA 50, W9AWY 47, W9FYC 46, W9EIV 45, W9IO 41, W9BJP 30, W9FZO 29, W9BFL 21, W9CZC 18, W9AHX 16, W9AG 16, W9DFZ 13, W9FEB 8, W9DIB 8, W9BPG 7, W9ANO 3, W9ELV 2, W9GMX 1, W9DNZ 20.

KANSAS — SCM, J. H. Amis, W9CET — W9JA leads the section with a total of 471. The following gang at Manhattan also turned in fine totals thanks to W9JA; W9GHR, W9GAU, W9CHX, W9ERR and W9FVR. W9DNG is going to Germany for his health. W9CXW is working on a new SG receiver. The 'phone RM, W9ESL, reports several stations are getting lined up for 'phone ORS. W9BSI has a very fine 'phone. W9CFN has been working three schedules daily. W9GKT and W9FXY report. W9GNL is a new reporter. The CW RM, W9FLG, has just completed plans for an all-state ORS Night. W9BGL is thinking of crystal. W9NI had a filter condenser go west. W9CET plans to go on 14,000. The following officers were elected in the KVRC for the coming year: W9EVT, Pres.; W9BBM, Vice-Pres., and W9DEB, Secty and Treas.

Traffic: W9JA 471, W9GHR 95, W9GAU 88, W9CHX 73, W9ERR 94, W9FVR 54, W9DNG 81, W9FLG 132, W9CXW 26, W9ESL 105, W9BSI 34, W9CFN 57, W9NI 62, W9GKT 195, W9FXY 73, W9GNL 12, W9BGL 21, W9HL 35, W9CET 63.

MISSOURI — SCM, L. B. Laisure, W9RR — W9FTA and W9GDU report activity for the Mississippi Nines Club. As an introduction they are conducting a traffic contest. 100 QSL cards will be awarded each month for three months from this issue of *QST* carrying this announcement, to the station in Missouri handling the most traffic. No one can win more than one prize. W9FTA handled a lot of quake traffic with NN1NIC. W9DOE also handled some with NN7XJ at Managua. W9ATX is a candidate for ORS. W9DZN reports more ham QRM on Airways channels. W9PW is still busy with U.S.N.R. W9ECI expects to be on more. W9DYJ reports a lot of 14 mc. DX. W9DKG reports rebuilding. W9GBA is down on 14 mc. W9BGN was busy with U.S.N.R. work. W9DHN says school QRM. W9FSL and W9DHF report. W9EPX is tied up with BC operating. W9BGW was promoted in the U.S.N.R. W9EYG managed to get a few messages. W9ENF has three transmitters. W9CDU was rebuilding. W9CJB blew a type '52. W9FAL put in M.O.P.A. W9FVM is running a ham factory with three more stations in production. W9ASV is planning to go to 100-watts crystal. W9BJA reports a new ham at Bethany, W9GOM. W9GBR resigned as secretary of the S.M.A.R.A. The SCM received a copy of the new Kansas A.R.R.L. bulletin published by the KVRC, W9DEB (secretary) at Topeka; some dope sheet. Also the S.M.A.R.A. bulletin, from W9EYG. W9AOG is on 7 and 14 mc. W9RR worked K6DV on 3.5 mc. W9CFL is busy days and nights and in between with U.S.N.R. work. W9DQN is still QRT for more junk to rebuild. W9FHT is a new ORS.

Traffic: W9FTA 61, W9DZN 2, W9PW 47, W9ECI 11, W9DYJ 15, W9DKG 1, W9BGA 22, W9DHN 2, W9FSL 25, W9DHF 8, W9BGW 20, W9EYG 10, W9ENF 23, W9CJB 20, W9FVM 43, W9ASV 123, W9BJA 232, W9AOG 14, W9RR 48, W9NP 205.

NEW ENGLAND DIVISION

EASTERN MASSACHUSETTS — SCM, M. W. Weeks, W1WV — W1ASF continues his schedule with W1UN and heads the traffic list. He worked his 97th country, Siberia, on 14 mc. W1LQ makes the BPL on deliveries. FB! W1ASI is using a 50 watter on 7 mc. W1ABG has a new portable outfit under the call W1BYK. W1CCP blew his power transformer. His portable call is W1BSF. W1BXB is experimenting with new antennas at new QRA. W1AZE is keeping two VO schedules using 14-mc. 'phone. W1BZQ is using his new transmitter for 'phone and c.w. on 3.5 mc. W1LM is cancelling his schedules for the summer. W1KH and W1WV are keeping schedules with VO8AE. W1WV is on 14 mc. and keeping daily schedule with G2OL. W1CAW now has his second-class commercial license. W1AFP expects to build an M.O.P.A. soon. W1CHR has completed his crystal set. W1ATX worked some DX on 14 mc. W1CQN has been trying 14 mc. W1ANK has rebuilt his Ultraudion to a TPTG. W1ACD is saving up for a new type '52 with mercury arc. W1ME worked all continents. W1AAL is our latest ORS. W1BCF reports some traffic. W1BKD-W2AJP is working at W1MX. W1BGW is trying new antennas. W1AFF reports change of QRA.

Traffic: W1ASF 177, W1LQ 142, W1LM 79, W1ASI 74, W1ME 67, W1WV 62, W1AFP 62, W1KH 54, W1ABG 42, W1CCP 41, W1CHR 38, W1BGW 32, W1AAL 30, W1ACH 27, W1BZQ 27, W1AZE 25, W1ATX 25, W1CQN 16, W1ACD 14, W1CAW 14, W1AFF 11, W1ANK 9, W1BCF 9, W1BFC 5, W1WU 4, W1BKD 4, W1KY 2.

MAINE — SCM, G. C. Brown, W1AQL — W1BIG leads the list this month. W1CDX has a good report. W1BEU has a good line of schedules. W1APU was QSO G6RB on 3500 kc. W1BGZ has a new transmitter. W1BEZ is off the air due to rebuilding. W1CEM sends in first report. W1FQ recently returned from a course in Toll Wire Testing. W1QH is QRL with his new "Chev." W1BFA is trying his luck at key thump building. W1AKR, W1AWY and W1CFJ are having fine luck with half-wave Zeppe. W1BLI reports new comer, W1BKU, on the air in Orono.

Traffic: W1BIG 65, W1CDX 62, W1BEU 48, W1AQL 19, W1APU 14, W1BFZ 12, W1BGZ 7, W1CEM 2, W1BFA 1, W1BLI 47.

VERMONT — SCM, Clayton Paulette, W1IT — W1CGX and W1BD are tied for first place. W1BAS, ex-W1BCK, is on the air. W1ATF gives us dope on new station in St. Albans. W1AOA got his ORS appointment. W1BEB is on 14 mc. W1AXN is on 7-mc. band. W1BNS is aspiring to ORS. W1CBW is new station in St. Johnsbury. W1IT is on 3800 kc. W1SV sends in a report. W1BJP is QRL with Refrigeration game.

Traffic: W1CGX 164, W1BD 164, W1ATF 160, W1AOA 64, W1AKN 14, W1BNS 6, W1IT 6, W1SV 5.

WESTERN MASSACHUSETTS — SCM, Leo R. Peloquin, W1JV — W1ASY will be glad to arrange schedules for any one wishing one. W1AZW has applied for reinstatement as ORS. W1AIF has cancelled his schedules. W1BVR is going through his monthly rebuilding. W1BNL is building a fan-cooled M.O.P.A. W1AJD keeps a schedule with W1ASY. W1BXF turns in his first report. W1AMI is coming along fine. W1ATB is now handling traffic. W1BWY, W1BSJ, W1APL, W1BVP, W1BKS are on the air regularly.

Traffic: W1ASY 212, W1AZW 132, W1AIF 70, W1BVR 47, W1BNL 40, W1JV 51, W1AJD 37, W1BXF 35, W1AMI 22, W1ATB 31, W1BWY 12, W1BSJ 9, W1BVP 9, W1APL 8, W1BIV 7, W1BKS 1.

CONNECTICUT — SCM, Fred A. Ells, Jr., W1CTI — To W1MK, W1CJD, W1UE and W1ZY go the honors for making the BPL. W1CJD is the hard working RM. W1ZY is now an Official Broadcasting Station. W1AOI operates W1CNG. W1BEO put some new feeders on his sky wire. W1AMQ worked Africa on 14 mc. W1CTI bought a new car. W1BVW is not on much due to QRM. W1ES handled his in two weeks. W1BIX schedules VE3HD. W1ASP has a new crystal job. W1AFB built a new a.c. screen grid receiver. W1BDI worked W6AKW on 3900 kc. W1BBU was heard in New Zealand with 6.5 watts input. W1CTC and W1AGT send in their first report. W1OS reports W1ADW home after a sea voyage. W1CDS get PDC reports without any condensers in his filter. W1RP lost his 75-foot stick in a wind storm. W1AMG doesn't have much time for radio. W1BNB reports by radio via W1AGT. W1BHM had a nice trip to Florida. W1AVB rebuilt his receiver. W1TD has hard job in reaching out on 3.5 mc. W1QV has been appointed Official Observer. W1APJ applies for ORS appointment. W1ANC is an old timer from way back in 1907

W1ARB is working DX on 7 mc. W1CDR is active on 3.5 mc. W1BCG is reaching out with a flea power set. The SCM is logging all those who QRM the standard frequency signals from W1XP. Better QRX and make use of this service. W1ZY won handbook last month and W1CJD takes it this month. Remember deliveries count. W1BM, W1IV and W1ARB visited the Conn. Brass Pounders' Assn. meeting April 12th and heard Ed Manley give a fine illustrated talk on his work aboard VOQH.

Traffic: W1MK 463, W1CJD 368, W1UE 269, W1ZY 180, W1AOI 90, W1BEO 80, W1AMQ 61, W1APJ 69, W1CTI 53, W1BVW 46, W1ES 31, W1BIX 29, W1ASP 24, W1AFB 22, W1BDI 21, W1BBU 20, W1CTC 17, W1OS 14, W1ADW 14, W1CDS 13, W1AGT 10, W1RP 10, W1AMG 9, W1BNB 9, W1BHM 8, W1AVB 6, W1TD 5, W1QV 4.

NEW HAMPSHIRE — SCM, V. W. Hodge, W1ATJ — W1IP is high man again. W1CCM is unable to use c.w. W1APK burned up his mercury vapor rectifier. W1AUY works the West Coast easily on 'phone. W1BFT worked good DX during the tests. W1AEF is not on much. W1CAF has worked 27 countries. W1BNJ is 2nd op. at W1CAF. W1UN is handling a bunch of traffic. W1BAC says QRM from school plays cut down his total. W1LY pounds brass whenever he gets a chance. W1BVJ of Gorham is a new ORS. W1BII was a visitor at the SCM's. W1AVJ is trying out a big tube on 'phone.

Traffic: W1IP 229, W1UN 86, W1CAF 44, W1BAC 43, W1APK 38, W1ATJ 23, W1CCM 2, W1AUY 1.

RHODE ISLAND — SCM, N. H. Miller, W1AWE — W1GV is coming along fine in the Naval Reserve as is W1BLJ. W1CAB is now an Ensign. W1BDQ would like to play chess with some ham. W1BIL just shipped out. W1MO is still working the world. W1ATM is on with his new T.N.T. W1EX is on with the U.S.N.R. W1AWE built a new T.N.T. W1ARK, W1AUV, W1BDB, W1BIT, and W1EX delight the BCL's with their service work. W1AFO is working them all on 14 mc. W1AMD, W1CNZ, W1BOP and W1BML are still going strong at W1DZ-WJAR. W1BGA is building a crystal rig for 3.5 mc. W1AMJ has a new 'phone. W1CPV says no one seems to have any traffic. W1AAD is perking out FB on 7 and 3.5 mc. W1ASZ has his new transmitter going. W1BTP is working FB. W1BQD has been too busy for ham radio. W1DW still "knocks 'em dead." W1RJ and W1JJ are new hams in Woonsocket.

Traffic: W1GV 43, W1CAB 33, W1BGA 15, W1MO 12, W1BDQ 12, W1AWE 7, W1AAD 3, W1ASZ 2, W1CPV 1, W1BLJ 1.

NORTHWESTERN DIVISION

IDAHO — SCM, Oscar E. Johnson, W7AKZ — W7KG and W7QC are rebuilding. W7AXY has been working FB DX. W7IY has been QRL. W7AUR got home for Easter. W7AT is building a portable. W7QD is an ardent 'phone supporter. W7ALW is QRL commercial work. W7AFN, W7AT, and W7AR tried to visit the SCM at 5 a.m. W7ACO is getting the bugs out of his crystal rig. W7ACD is moving to 28 mc. W7ALY-ATN say the gang at Parma are getting lined up for U.S.N.R. work. W7FB is working ZL and VK on 14 mc. W7AOO has worked all districts on 3.5-mc. 'phone. W7AIH has about completed new push-pull rig. W7AFT is crippled by lack of power. W7AKZ is on 3.5 CW.

Traffic: W7AFT 29, W7FB 4, W7AOO 8, W7ACD 20, W7AT 14, W7QC 18, W7IY 13, W7KG 5, W7ALW 10, W7QD 10, W7AKZ 20.

WASHINGTON — SCM, Eugene A. Piety, W7ACS — The Sweepstakes put W7RT in the "Gravy" spot for this month. W7BB and W7AIT also make the BPL. W7KZ tried to score in transcons and make a good job of it. Spokane seems to have been roused by the work of W7VL. W7OI and W7AGF report for the first time. W7AHO is spending his time pounding brass. W7APR worked "VK." W7AVM and W7ADS want ORS. W7AQB gets on occasionally. W7AXL, W7AJY, W7ARO, W7ADR, and W7ABN all live within five blocks of each other. W7OJ reports DX too good to pass up this month. W7ANR, the 'phone man, handled a few. W7AQ is on quite frequently. W7IC and W7ARI also get on occasionally. W7TK is the only active ham on in Everett. W7MW is hanging around trying to get his set to perk. W7WY is interested in Naval Reserve work. We have a first report from a real old timer, W7WE, ex-7GE. W7AFX keeps Snohomish going strong. W7AJS manages to keep his own station and the college station, W7ADK, going strong. W7WU reports for the first time. W7DF got a blister on his finger pounding brass in the Sweepstakes. W7FJ also ran in the Sweepstakes. W7KO is on, chewing the fat as usual. W7AG-SL keeps his mike hot with good old fashioned hot air. W7APT and W7JB report for the first time. W7LD is rebuilding to push-pull. W7KT is working at KPCB. W7QI is trying to arrange an inter-city dinner. W7TX is working late these days. Jack Nahagawa reports a good total but forgets to include his call or address. W7OV has a grudge against the fellows who don't answer the letters he sends out in his capacity of RM.

Traffic: W7RT 295, W7BB 169, W7AIT 130, W7TK 95, W7AFX 88, W7KZ 82, W7OV 80, W7WU 89, W7OI 65, W7AHO 50, W7JB 46, W7AG 40, W7TX 38, W7ABN 36, W7OJ 35, W7QI 33, W7ADS 31, W7ACS 26, W7AVM 25, W7FJ 21, W7KO 21, W7AJY 19, W7ANF 18, W7ADK 17, W7WY 16, W7AQB 15, W7AJS 14, W7AQ 12, W7IC 11, W7WE 11, W7ARI 9, W7KQ 8, W7APR 7, W7APT 7, W7AYM 6.

MONTANA — SCM, O. W. Viers, W7AAT — W7AKD turns in a wonderful total. W7MZ gets on occasionally. W7CU got a QSA 5 report from KA1ZC. W7HP is working lots of DX. W7ARJ had to quit college due to heart trouble. W7AMK says school and track keep him plenty busy. W7AHF has some hot shot schedules. W7AFS handled a few. W7AOH moans the loss of a good 50 watter. W7BCA, an old telegraph operator, is plenty in love with ham radio. W7AYR is working his share of DX. W7AFU hooked his first K6. A new station at Sheridan, W7BDJ, reported for the first time. W7ASB is putting out some good signals. W7AAT has a new 42-foot antenna pole.

Traffic: W7AAT 290, W7AKD 152, W7CU 73, W7HP 29, W7AHF 12, W7AMK 11, W7AFS 10, W7AFU 9.

OREGON — SCM, Wilbur S. Claypool, W7UN — W7AWH sends in the largest single report yet. W7ZD maintains several good schedules. W7ED anticipates Alaskan schedule work during the summer. W7SY overhauls transmitter. W7APE leads Coos Bay gang. W7ALM visited R.C.A.R.C. W7AOF is aiming for ORS. W7AMF is crystal controlling M.O.P.A. W7AHJ contracted PI. W7PE sends code practice on 1750 kc. W7WL has five crystals. W7QY finds VK and ZL DX fine about midnight on 14 mc. W7WR is keeping no schedules. W7GE is heard regularly. W7HD has his type '10 perking. W7AIG complains of no DX. W7AMQ plans to visit LA section. W7IF reports. W7UK has three transmitters. W7AME is going to try 'phone. W7ANU is a new man. W7EO has his license up for renewal. W7AJX is doing nicely as Prexy of Coos Bay Club. W7PL and W7MV lose ORS.

Traffic: W7AWH 708, W7ZD 157, W7ED 79, W7SY 66, W7APE 53, W7ALM 41, W7AOF 35, W7AMF 30, W7AHJ 28, W7PE 21, W7WL 18, W7IF 16, W7QY 13, W7WR 13, W7GE 13, W7UK 8, W7HD 6, W7AIG 3, W7AMQ 3, W7ANU 2, W7AME 2.

PACIFIC DIVISION

SAN JOAQUIN VALLEY — SCM, E. J. Beall, W6BVY — The MARC handled the section quarterly hamfest at Modesto and it was a success in every way. W6KU has been on the sick list. W6BRV is after a comm'l license. W6DCG is working on hi-powered 'phone. W6BRW deserted hamming for motorcycles. W6FFU is rebuilding. W6CUL is out for DX. W6AV spends his off hours looking at Mars with a home-made telescope. W6COJ is one of the live ones. The MARC staged a hidden transmitter hunt with W6BRV and W6DCI finding it in short order. W6APJ has no trouble QSOing K6 stations. W6EHD is on with a 205D. W6CUL expects to take a cruise. W6CXT is high man for this month. W6DKH just completed a new shack. W6FFP is a new OBS. W6EXM is a new reporter. W6AHO handed in a good report. W6BYH finally came through with a FB report. W6BUZ is all for 14,000 kc. W6CLP has yet to miss any kind of a ham gathering.

Traffic: W6CXT 205, W6EXM 8, W6EKH 7, W6AHO 135, W6BYH 33, W6BUZ 12, W6CLP 52, W6BJE 51,

W6FFU 2, W6BNH 1, W6APJ 43, W6AV 28, W6QA 41, W6BVY 87, W6FFP 51.

LOS ANGELES — SCM, H. E. Nahmens, W6HT — By the time this report is read, Kern County, containing Bakersfield will have been shifted to the San Joaquin Valley Section. Eight stations made the BPL this month! W6QP, W6EGK, and W6ETJ made it both ways! W6QP says he is sorry about the "punk report" this month. At the last quarterly banquet held in Pasadena the A.R.R.C. presented W6WA with a beautiful silver cup for the best all around amateur station in the Sixth District by the A.R.R.C. W6EGK is a brand new ORS. W6AOA sends in fine total. W6AKW reports more new hams in Lancaster. Some fast relay work between east coast and Hawaii is reported by W6CII. W6ETJ has moved into a new shack. W6DQV reports traffic improving. W6AM ran good total in International Contest. W6TE is getting hot about 14-mc. 'phone. If you want to see an efficient station visit W6DLI. W6BQC has a set working on 56 mc. At last W6ESA located that pesky power leak. W6ON reports a new ham in Pasadena, W6EBK. W6DER says all hams in Pomona except one are crystal controlled. W6NF wants to be an ORS. W6CUH worked 54 foreigners during tests. W6LN was paid a flying visit by Ada Giesking, ex-9CCM of Denver. W6WO blew ten blocking condensers before getting new heap to perk. W6BGF had to add some guy wires to take the "flapper curves" out of his masts. W6EQD has crystal on 7280 kc. Traffic low at W6ID account resting up after contests. According to the Deacon at W6VH DX on 14 mc. has been rotten. W6OF says DX pounding in on 14 mc. W6AVB is on the key at W6CXW. W6AWY reports nine hams just enlisted in VCR of USN. W6ATE, W6AUL, W6ASK and W6CPS are new hams in Santa Maria. W6BCX is convalescing from YLitis on 3.5 mc. W6EZK has rebuilt to push-pull. W6EEP moved into house. W6MA keeps daily schedules with her OM, W6ZZA. W6BVS took message from VP1AJ for Yale University. W6AYL has seven-tube high-frequency super-het. Portable W6ZZA got QSA5 R8 from Japan while in hotel in San Francisco. W6BVZ says new 7-mc. doublet receiving antenna cuts noise level in half and increases signals three times. W6AOR has 250-watt crystal rig. W6FJ had hard time keeping ahead of bill collectors. W6ASM is getting desperate. W6MK sends in good example of famous last words of an ORS. "My station will be on air in short time." W6HT is making an effort to visit every active ORS on the air. W6FDK is building a.c. receiver. W6EQO and W6EYG are fooling with 56-mc. 'phone. W6EZD is QRL school. W6BLD put up high-powered Zepp. W6EAZ installed relay. W6FDL rebuilt transmitter. W6EXX is looking for traffic. W6ELV is 3500-kc. 'phone. W6AQD has a wonderful new 'phone job. New clubs heard from are the Hollywood Short Wave Club and the Amateur Radio Club of San Bernardino. It is rumored a new club has been formed in Riverside. The A.R.R.C. has good eats at every meeting. The A.R.A. of Long Beach held a banquet at the Skippers Chowder House on April 24th including election of officers, entertainment and valuable prizes.

Traffic: W6QP 739, W6EGK 322, W6AOA 334, W6AKW 283, W6CII 207, W6ETJ 213, W6DQV 184, W6AM 148, W6TE 145, W6DLI 100, W6CZZ 66, W6BQC 63, W6CFN 53, W6ESA 32, W6CUH 94, W6ON 24, W6WO 20, W6BGF 19, W6DZI 18, W6EQD 16, W6EZG 15, W6CZT 15, W6ID 14, W6VH 12, W6CXW 11, W6DER 10, W6AWY 10, W6OF 8, W6EZK 8, W6EFE 6, W6MA 5, W6BZR 5, W6BVS 5, W6AZU 4, W6AYL 4, W6HT 3, W6ZZA 3, W6BVZ 3, W6AEO 3, W6EBD 2, W6EWK 1, W6EKE 254.

SANTA CLARA VALLEY — SCM, F. J. Quement, W6NX — W6YG's 662 messages certainly looked good this month and with W6HM handling his usual trans-pacific traffic, these two stations alone accounted for 1200 messages. The traffic contest between the SF-Oak and SCV sections starts with this month's reports. W6AMM is clamoring for PI traffic. W6ALW will have a type '03A on 3500 kc. soon. W6BMW is putting in a pair of '52s in push-pull. W6DMJ is new ham from Carmel. W6YU promises to handle over a hundred messages next month. W6FBU at Stanford University is offering free message service for students. W6DCP's YL is learning the code! W6ACV clicked with KGEG the ship *Northern Light*, the operator being Bill Crabbe W6ESW. KGEG is anxious to contact amateurs. W6CEO is building an M.O.P.A. W6PH successfully passed his tests for commission as ensign in U.S.N.R.

Traffic: W6YG 662, W6HM 435, W6AMM 156, W6ALW 125, W6BMW 86, W6DMJ 51, W6YU 36, W6FBU 35, W6DCP 12, W6ACV 13, W6CEO 12, W6NX 3.

SAN FRANCISCO — SCM, C. F. Bane, W6WB — W6EKC leads the parade with one sweet total. W6ABB is also right up in there. We wish we knew some dope on W6DFR. W6ERK says that business is still pressing. W6WN is the deep bass you hear down at the ball park these days. W6DZZ is skedding KA1CE. W6ZS and W6CIS (now all one) are planning to go into traffic on a big scale. W6BIP finds little interest in traffic these days. We want to apologise right now for an oversight that occurred last month. The report of W6DWJ (a nice one) was erroneously credited to W6ERS. Darned sorry, OB. W6CAL got cheated out of his report last month because it didn't show up in the mail. He now sports W6QV. W6DXW and W6BVL report again. We have a new reporter in the person of W6MV. W6EFF is another first timer. The "KEN" heard from W6WB is no other than W6ETR, who is second op. W6KJ is an ensign in the U.S.N.R.

Traffic: W6EKC 237, W6ABB 148, W6DFR 133, W6ERK 112, W6DZZ 61, W6ZS 46, W6BIP 41, W6CAL 28, W6DXW 21, W6MV 18, W6WB 42, W6BVL 7, W6EFF 7, W6KJ 3.

EAST BAY — SCM, J. Walter Frates, W6CZR — W6ASH ran up a grand total of traffic. Read handled traffic in the Nicaragua earthquake disaster. W6BPW came within 200 of W6ASH's total. W6DQH has moved his QRA to 2232 Channing Way, Berkeley. He says W6EKC gave him a new type '10. W6ALX is the callbook and handbook headquarters for the section. W6BMS reported direct to Hqs. The boys at W6NM boost the section totals considerably each month. W6BZU was so affected by the sight of the surrounding hills covered with flowers and spring greenery that he boosted his totals up this month. W6EGM has been maintaining a sked with F3OCB, old BAM, at Tahiti. W6ATJ reports that traffic is low this month. He reports W6YM on the air at the Central Trade School of Oakland. W6CYD keeps up a steady output of messages each month. W6BI is rounding the Berkeley fellows up in fine shape. W6AIC has been pounding brass in great shape for some time. W6AUT expects to have his two 50 watters going soon. W6BYS has let his license lapse. W6CZN is on regularly with his 50 watter. W6AZH has completely rebuilt his station. W6CIG blew his type '10. W6ZM has been too busy working nights and sleeping days to snaffle any traffic. W6BTZ is still making the ether sing. W6BBJ is still playing with his 14,000-kc. radiophone job. W6CIE makes his début with the traffic men. W6EWJ is another of the Berkeley boys whom W6BI has rounded up. W6FAJ says the hardest message of the month was one completely in Spanish. W6BUX has a 'phone job on 14,000 kc. W6BJI has two ops. W6CDA worked XU5WA off the China coast. Upson, former CRM, came back from a voyage on the *President Harrison*, and is going out on the *President Johnson*. W6AWF is on the *President Monroe*. The Oakland Radio Club gave a banquet and hamfest in East Oakland during the month. Lucas, skipper of the U.S.N.R. unit recently gave a talk before the Berkeley Radio Association.

Traffic: W6ASH 603, W6BPW 426, W6DQH 205, W6ALX 88, W6NM 70, W6BZU 51, W6AIC 48, W6EGM 45, W6ATJ 41, W6CYD 41, W6BI 35, W6AUT 34, W6AZH 27, W6CIG 21, W6ZM 16, W6BTZ 16, W6BBJ 15, W6CIE 14, W6EWJ 15, W6FAJ 13, W6BUX 9, W6CZN 5, W6YM 3, W6BJI 2, W6CDA 1, W6BMS 11.

HAWAII — SCM, L. A. Walworth, K6CIB — This report was received at W6FFP by radio from K6COG and mailed to Hqs. FB!! The SCM made a trip to Hilo and Maui during Easter vacation. K6YAJ has a new two-story shack. K6COG is the new Chief Route Manager. K6AJA is getting results as RM of the big island. Hilo High School is now on the air with K6YO. K6YAL is finding remote control on 'phone an engineer's job. W9EXT of Appleton, Wisc., was heard on 3500-kc. 'phone by several hams this month. K6DV has been renewed and Sgt. Randall is chief operator. A

called meeting of all A.R.R.L. members on April 8 resulted in several resolutions being sent to Director Babcock for his guidance at the annual Directors' meeting. K6YAL is handling OBS on 3500 kc. 'phone. K6EXP is the first to use crystal control on 'phone in Hawaii. K6DQQ is soon to be on the air again. K6CRW is building a radiophone. K6BVP has a 'phone but no mike. K6ENE was over from Molokai for two weeks following Easter. K6BOE has been visiting several fellow hams. K6BQJ has moved his dental office to a cozy room in the James Campbell Bldg. Capt. Richmond of the 9th Signal Service Co., Fort Shafter, is now organizing the Army amateur net throughout Hawaii.

Traffic: K6DV 402, K6COG 260, K6AJA 259, K6BOE 81, K6ERH 80, K6CAB 37, K6ENE 31, K6CCS 23, K6BAZ 22, K6CRW 20, K6FEZ 17, K6DYC 13, K6BUP 6, K6ERO 5, K6CMC 1.

ARIZONA — SCM, H. R. Shortman, Jr., W6BWS — At this writing your present SCM has only two more months to serve. Let's make June the biggest month in the history of the state. Let's have a report from every man in the state, regardless of activity. W6ALU has a whale of a total. W6EPF turns in a fine report. W6DGN is leaving for Chicago for the summer. W6EUT reports via radio through W6CEC. W6CEC has been on every night in the 'phone contest. W6BMJ is building up a crystal set. W6BWS-W6VV returned from a very enjoyable business trip to Dallas, Texas. W6EEB and W6BWS met a friend of W6CTP, who is living in Phoenix. W6DRE and W6DJH have been installing a new R.C.A. transmitter at KOY. W6EFC was injured in an explosion. W6EOF is still at KGUO. W6EAA is back from Radio School. W6ANO is now in Winslow. Ex-6CAJ bought an airplane. Ex-W6EH is in Big Spring, Texas, with KGUG. Ex-6EKY is now in Salem, Oregon. As far as the SCM can find out, W6BJF, W6AZM, W6DCQ, W6AAM, W6DIE, W6AWD, W6BFA, W6DTU, W6DXC, W6PZ, W6CAP, W6DLE, W6BHC, W6DHA, W6BBH, W6BGA, W6RS and W6ASA, are all inactive.

Traffic: W6ALU 685, W6EPF 48, W6CEC 149, W6EUT 17.

NEVADA — SCM, Keston L. Ramsey, W6EAD — W6AJP and W6UO made the BPL. W6AJP has schedules with W6UO, W6ASH, W6CLP, W9DKL and W6FAC. W6UO has schedules with W6BI, W6AJP, W9EAM and W6TM. W6CDZ has been working Naval Drills and Sectional Intercept Schedules regularly. W6BYR has a new M.O.P.A. W6CRF has a 16-tube 'phone transmitter. W6BTJ is disturbing the ether with type '10. Three Reno stations were reported in April *QST* as being heard in New Zealand on the 3500-kc. band. The Nevada Amateur Radio Association is still going strong.

Traffic: W6AJP 218, W6UO 159, W6CDZ 71, W6BYR 40, W6CRF 30.

SAN DIEGO — SCM, H. A. Ambler, W6EOP — W6AXV leads the section. W6EPF is back on the air. W6AEP is on 'phone and CW. W6EOP is building a new receiver. W6EBX expects to be ORS soon. W6EMA rebuilt. W6CTP is still working DX. W6DAS is on 7 mc. W6BAM says W8EY dropped in to see him. W6AYK is on with a type '45. W6DAT is heard once in a while. W6EZP is back again. W6DNS is still making car radios. W6DNL is back from war maneuvers. W6DNW has been heard on 'phone and C.W. W6QY is moving again. W6EOL has a new transmitter. W6AJM expects to be on 14 mc. 'phone in a short time. W6ZQ is heard on 14 mc. 'phone. W6CTR is on 'phone. W6DAI is on with crystal 'phone. W6BFB expects to soon be on with a new outfit. W6HY is building a new receiver. W6BOW is the call of Dr. McCormick.

Traffic: W6AXV 68, W6EPF 30, W6AEP 21, W6EBX 16, W6EOP 14, W6EMA 8, W6CTP 6, W6DAS 5, W6BAM 4, W6AYK 2, W6DAT 1.

PHILIPPINES — Acting SCM, John R. Schultz, KA1JR — This report received by radio at W6TM from KA1JR. KA1HR has ten daily schedules. KA1ZA handles schedules with WNHM. KA1SU had bad luck with his doubler. KA1CM handles traffic for Fort Mills. KA1CO, a newcomer, owns KA1HC outfit. KA1CE is experimenting on s.w. receiver. KA7LG is after 1931 sigs. KA1SP will handle schedule with W6ETJ soon. KA1RC keeps regular schedule with KA1CE. KA1JM is another ham at Cavite. KA1SL has schedule with W6AMM. KA1EL, KA1MV, KA1XA, KA8AA and KA4HW report no activities. OM1TB is active ORS.

Traffic: KA1HR 1030, OM1TB 425, KA1JR 225, KA1CE 292, KA1SL, KA1SP 40.

SACRAMENTO VALLEY — SCM, P. S. Farrelle, W6AXM — W6AXM made 499 deliveries, all by Air Mail. W6AIM sent his report to HQs. W6TM is again going strong with five splendid schedules.

Traffic: W6AXM 654, W6TM 275, W6AIM 35.

ROANOKE DIVISION

WEST VIRGINIA — SCM, D. B. Morris, W8JM — W8BOK visited W3AEX in Washington, D. C., and had the pleasure of hearing his own 'phone coming in QSA5-R9. W8AWT-W8AIJ operated W8BOK while W8BOK was away. W8AIJ-W8AWT is going back to Univ. of Michigan. W8CBV reports a new ham, W8DVD, in Wheeling. W8TI reports that everything is OK. W8DPO reports three new hams: W8ELO, W8AZD and W8AUD. W8DNN is yelling for a Saturday evening schedule. W8CAY has the station torn down due to moving it to the National Guard Armory. W8CKE makes his first report. W8BOW will be known as "The Voice of QRM." W8BTV is called "Benny Sent Me." W8BOK is known as "The Cat's Meow." The SCM wishes to offer at this time heartiest congratulations to ex-W8VZ who recently took unto himself a wife. W8OK, the RM of W. Va., deserves your support, gang. W8ATE makes more interference than the Grafton street cars. It is with deep regret that I announce my resignation as Section Communications Manager of West Virginia. This position requires more time devoted to it than I have to spare, so that this condition becomes necessary. I want to thank the West Virginia hams for their cooperation during the past year and hope they continue to give the future SCM the same assistance.

Traffic: W8BOK 50, W8AIJ 33, W8DPO 26, W8BTV 22, W8TI 20, W8CBV 20, W8CAY 13, W8BOW 14, W8OK 178.

VIRGINIA — SCM, J. F. Wohlford, W3CA — W3CXM turns in his usual splendid total. W3AFT sent in a good report. W3BLU is the call for the station that formerly held W3AWS. This station handled 83 messages from NN1NIC the night of the day of the 'quake down there. W3AGH was QSO K6DV on 3.5 mc. W3BBX is new station at Ashland. W3BGS says the OW has him working in garden, and flower beds. W3KU got his report in. W3AER is working 3.5 mc. 'phone. W3TN is still convalescing. W3WM on now and then. W3AWY moved from Ocean View to Portsmouth. W3II is tinkering with television. W3HL is plenty active. W3BHJ is one of the WTAR gang. W3NO is using one of W3KU's transmitters. All activities reported in the Norfolk vicinity were sent in by W3KU. W3ARU sent in report early in month. W3ZA uses his 'phone to handle traffic. W3FJ has been confined to his bed account illness. Here's hoping that he soon gets back with us. W3AEW keeps schedule with W6ETM. W3SE and the SCM worked for 45 minutes on 'phone one morning. W3BZ does some little hamming around. W3WO has gone fishing. W3BDZ is working hard on his patent. The Virginia net working on Sunday afternoons is still making headway and the gang seem to have a big time of it.

Traffic: W3CXM 671, W3BLU 143, W3FJ 63, W3AEW 62, W3ARU 59, W3AGH 50, W3WO 22, W3ZA 15, W3SE 9.

NORTH CAROLINA — SCM, H. L. Caveness, W4DW — The Winston Salem hams sure are on the right track now. Their slogan is, "Winston Salem 100% crystal controlled." W4IF is using a single crysta -controlled '10. W4AHF is building a four stage crystal job. W4OG has increased his power to an '03-A. W4ABT uses five stages in his crystal rig. W4AAE has joined the A.A. net. W4TR is adding a '52 to his crystal outfit. W4EC has been on the air with his portable, W4PBO. W4AIS's 50 watt crystal job is practically completed. Law is occupying the mind of W4PBN. W4AEL is working some good DX. W4ABW has had some hard studying to do for exams. W4AGO and W4JR are still interested in A.A. work. W4PBD is on the air late at night. W4ZB had a crystal go west FOB, so he says. W4AA has

been keeping a schedule with G6GX and W6CAL. W4DQ has been working some W6's and W7's. W4AGF is now on the air with MOPA. W4RX sends in a bunch of DX worked. W4GG has been away on a vacation. We regret an oversight in our last report. W4RE sent in some information which we failed to include. He has returned to the air after a few years' absence, using a '10 tube and operating mostly in the daytime on both 3940 and 7240 kc. W4ABV and W4AK are working together now since both are living at the same address. W4ANU is getting out well for a beginner. W4AVT at Wendell is also a new ham. W4ATC is on the air occasionally. W4EG says that the demand for wedding invitations which is characteristic of this season of the year has kept him off the air most of the month.

Traffic: W4DW 56, W4AA 32, W4AEL 30, W4AIS 28, W4ZB 23, W4PBO 14, W4RE 12, W4PBD 8, W4ABV 7, W4ABW 6, W4AGO 6, W4TR 6, W4RX 4, W4PBN 2, W4GG 1, W4JR 1.

ROCKY MOUNTAIN DIVISION

UTAH-WYOMING — SCM, C. R. Miller, W6DPJ — W7AWZ pushed through quite a bunch of traffic. W7HX has not been feeling well. W7AWG is working with low-power. W7AAH has been busy with business. W6BTX was also too busy to get on the air much. W6DAM, in Tooele, reports for the first time. W6DPJ made the BPL.

Traffic: W6DPJ 203, W7AWZ 68, W7HX 18, W7AWG 16, W7AAH 16, W6BTX 10, W6DAM 5.

COLORADO — SCM, Edward C. Stockman, W9ESA — W9DNP is working on a 150-watt outfit. W9EAM is keeping schedule with W6ASH. W9CDE, W9AAB and W9ESA report success with the Red Cross Message. W9AAB is operating a new push-pull TNT low power rig on 3.5 mc. W9GBQ is experimenting with Zepp and Doublet antennas. W9EFP is again busy on the farm. W9FXQ and W9DOC are on with 3.5 mc. 'phones. W9FSJ is new station at Iliff. W9FXP is with us again. W9FRP is new Denver station. W9APZ says a Westinghouse 1-tube B/C set works fine as a monitor. W9DNT is temporarily off. W9FPZ has returned from school. W9BFP is new station at Canon City. W9CXG has moved to Bovina. W9CSR has been issued new OBS and ORS certificates.

Traffic: W9ESA 243, W9GBQ 49, W9AAB 46, W9FXQ 46, W9DNP 38, W9EAM 38, W9FRP 14, W9FXP 11, W9DNT 5, W9CDE 4, W9EFP 3, W9APZ 2.

SOUTHEASTERN DIVISION

ALABAMA — SCM, Robt. E. Troy, Jr., W4AHP — W4IA's 'phone was heard R7 in Australia. W4VC is having trouble with BCL's. W4DD is working on a television receiver. Bill Heer, an old ham, is getting back on the air. W4AAH boasts a Jr. op. W4KP is experimenting with 'phone. W4AKM had an impromptu hamfest with W4DS, W4RS, W4ALG and W4AIK in attendance. W4AG complains of the many bum notes. W4TI is temporarily sojourning in Greensboro. W4RS is working everything he can hear. W4EF is on maneuvers at Fort Benning. W4AP is operating as usual. W4AHP is working everything but other hams. Hi. W4ASM is getting on fine.

Traffic: W4RS 17, W4AHP 9, W4AG 9, W4ASM 5.

GEORGIA-SOUTH CAROLINA-CUBA-ISLE OF PINES-PORTO RICO-VIRGIN ISLANDS — SCM, J. C. Hagler, Jr., W4SS — K4KD leads the traffic list this month with W4KV second. K4RJ is alternate control station in USNR. K4SA is off until outside power gets to him. K4AAN joined the Naval Net for P.R. CM8YB had a 'phone-CW QSO with W2AOE on 14 mc. CM8UF says that airplane QRM is bad when the fleet is in. CM2FN has shut down and will be on at W2AKC and W2AMT. W4HN sports a new QRN; 2011 Green St., Columbia, S. C. W4AMG has a fifty watter going. W4AFQ is with the Eastern Air Transport, Inc., in Spartanburg. W4DV turns in a good total. W4IJ is off due to school QRM. W4KX reports two new hams in Thomasville, Ga.; W4AUT and W4ASZ. W4APM is the station at the Junior College-Boys High School, The Academy of Richmond County, Augusta, Ga. W4QE comes to life and sends in a report. W4AEV lost a lot of sleep working DX. W4IU is soon coming on again with a crystal. W4BW is rebuilding his receiver. W4UC worked Cape Town, S. Africa. W4PM sends in his usual good report. The head lady chased W4AHT out of the dining room into a double garage. W4AY found that a 30-Henry choke makes a good coupling impedance for a type '24. W4JD visited W4AJ and W4AOX in Adel, Ga. ExW4HU was in Augusta for a week. W4AAY comes in third in the traffic total this month. W4WQ is trying out 3500-kc. 'phone. W4CE has worked VK, DA, G, VE, and W. W4AJH had business QRM. W4ACH has a nice, new, Regular Amateur License now. W4AQN is working the boys on his 3500-kc. 'phone. W4ZZI is W9FEA, who is spending the winter in Macon, Ga. W4AOX reports by radio. W4MA is going to higher power. W4PJ worked China, G, EAR, and FM. W4ARO is a newcomer in Cedartown. W4LL has a new crystal set on 7 mc. W4RM wants an old-time rag chewers' club on 1750-kc. 'phone band. W4QZ made a large number of contacts on 3500-kc. 'phone. W4DX hooked up with the A.A.R.S. as alternate for W4MN. W4VH was home for spring vacation. By this time he is back on at W3BIY. W4MN finds time to meet A.A.R.S. schedules Monday nights. W4VL works on 14 mc. The Atlanta Radio Club met at W4PM's and had a great time. W4BY sends in his first report. W4IR sends in a short but snappy report. W4NT is a brand new ham in Marietta, Ga. W4APW is picking up quite a lot of traffic. W4MO wants dope on ORS and OBS. W4GY reports that the Navy furnished NDJ (U.S.N.R. station at Atlanta) with a New RG (Navy 4 tube) receiving set. For information on U.S.N.R. get in touch with your Director, Mr. Harry F. Dobbs, W4GY, W4AZ or W4SS. The A.A.R.S. is going strong in this section. The drills on Monday nights are FB, and are running like clock work. Write to W4IR, W4KV or W4SS if interested. W4AJH and W4PM are OBS now. Our greatest need now is for one or more RMs, so some of you traffic birds speak up and let's get some routes going through this section. We must have an OBS and OO in V.I., P.R.; and Cuba. W4AJ said his receiver went Republican. The following men have their ORS appointments — W4PJ, W4AJH, W4AAY, W4DV, CM8YB, W4PM, CM8UF.

Traffic: K4KD 178, W4KV 102, W4AAY 57, W4PM 45, W4DV 35, W4APW 31, W4PJ 28, CM8YB 24, W4SS 24, W4WQ 17, W4MO 16, W4WB 15, W4ADD 12, W4WN 11, W4IR 10, W4AFQ 9, W4KX 7, W4VH 5, W4AJH 5, W4CE 5, W4HN 5, CM8UF 5, W4AOX 3, W4ABP 3, W4MA 2, W4ACH 2, W4AJ 2, W4QE 2, W4MN 1, W4JD 1, W4AY 1, W4BW 1.

WESTERN FLORIDA — SCM, Edward J. Collins, W4MS — Well, gang, here is our first real section report. We regret the loss of W4ALH, who has gone to U.S.S. Hydrographer as an operator. W4KB reports with a nice total. The "YF" at W4KB ops too. W4AQY is still having tube trouble. He reports two new hams in De Funiak; one of them is a "YL." W4AOO is now on 1750 kc. W4RK and the new "YF" are touring this section visiting ham stations. W4ADV is on again. W4DP reports no traffic his way due to having to work long hours. W4QR is chief opr. at the FNG station W4SC. W4AAX is pounding out on his 'phone regularly. W4AAX sent in a nice report. W4AFT sends in a report. W4AUA is going to buy W4ACB's 7½-Watt Hartley. W4ACB, our Route Manager, has a 50-watter on the air. W4ART is on with "B" Batteries. W4ASV is on at last. W4VR will be on soon. W4PN is having trouble getting a good power supply for his type '10. W4FV has been busy rebuilding his station. W4ARD is arranging schedules with the West Coast. W4SC is kept going FB by three operators. W4HQ has a FB MOPA. W4ASG is a new station in Marianna. S. K. Rhyne of the same town is awaiting a call. No word from W4ADC. W4MX has been having receiver trouble. W4ALJ is troubled with key-clicks. W4SK has been working a bunch of DX. W4QU has a low powered 'phone on 3500-kc. band. W4QK is planning on a trip to visit some hams in Memphis this month. W1ART has left our midst. W4ATN, another new ham, is going to be on the air as soon as he gets his power transformer finished. W4ABJ is off somewhere on a ship, but no one knows where. W4UW was home for a visit. His Texas call is W5NO. W4MS has moved into his new shack. The "YF" at W4MS is applying for her license.

Traffic: W4ALH 18, W4ACB 18, W4ARD 17, W4MS 16,

W4KB 13, W4SC 10, W4FV 8, W4HQ 8, W4QR 7, W4QU 6, W4AFT 4, W4ALJ 2, W4MX 2, W4AAX 22, W4SK 64.

EASTERN FLORIDA — SCM, E. M. Winter, W4HY — W4AAB, RM, Gainesville Territory; W4QL, RM, Miami Territory; W4SQ, RM, Tampa Territory. I wish to thank the amateurs of this Section for selecting me as their Section Communications Manager. I shall do everything in my power to give this Section the publicity it desires and is entitled to. Route Managers, whose names are given at the top of this column, will arrange schedules for any stations desiring schedules. The Knights of the Kilocycles of Florida is an organization of 'phone men, started December 25, 1930 with W4UH, W4DU, W4AAX, W4AKI and W4WS, the name being proposed by W4AAX, of Tallahassee. W4WS is control station. The following members report every Sunday morning over the air: W4DU (Secretary), W4AMQ, W4AAX, W4ABD, W4MF, W4ATG, W4AOC, W4TQ, W4ADB, W4AOW, W4KX, W4HN (Columbia, S. C.), W4AIV, W4UL, W4UZ, W4SQ, W4ATR, W4GS, W4AKI, W4UK, W4WS, W4ALQ, W4ABL, W4BN, W4AFN, W4AAW, W4FG, W4EY. W4HY has been trying to "get in" this exclusive (?) circle. W4JO handled 93 messages. The A.A.R.S. 'phone net of Florida hold their QSO at 6:15 p.m. each Monday. It consists of following: W4ABL, net control station; W4UH, W4GS, W4AIV, W4WS, W4DU, W4AKI, W4AAX, W4EY, W4AOW, W4MF, W4ATG, W4TQ. They kept in touch with army plane AB6 on its trips South. W4BN has just finished rebuilding his 'phone. W4AMQ has increased his power by adding another '03A. W4SQ has moved up to 3.5 mc. W4AKJ has at last mastered the code to rate 10-per! W4GS, is doing some splendid work in the Army Amateur net. W4AGR handled 5 messages in 10 minutes by 'phone. W4ACB is on the air with a very FB note. The Miami Amateur Club is just concluding an ALL STATES QSO Contest for Club members. Miami stations regularly on the air are W4LA, W4WT, W4NB, W4QF, W4MK, W4ABA, W4AEQ, W4BF, W4BT, W4FZ, W4NE, W4AJO, W4QL. W4NE has been very fortunate in European contacts. W4MK handled considerable traffic from Managua after the earthquake. W4IX is the station owned by Duncan, of WRUF. Marion Gulick, former W4ABL, is at the key most of the time. W4WW is back on with a type '10. W4ABF is 'phone crazy. W4ACS spends his time between the track and amateur radio. W4GD uses a type '10. W4SD is helping W4AGN in U.S.N.R. work. W4TQ lives about four miles from town. W4AOC is a new ham in Gainesville. W4AAB is active. W4WW is using a type '32 as a detector. W4AGN is U.S.N.R. control station. W4AGN and W4AOV belong to Ensign Lawson Hill. The Eustis, Fla., Amateur Radio Club was organized several months ago with Fred Bassett, Jr., W4AKI, as president, and W. Fred. Mantey as secretary-treasurer. Members are W4AHK, W4ADB, W4AIA, W4VE, Marion Wingfield of Unatilla and a winter visitor from Johnson City, Tenn., W. Jones. The outfit has two 'phones, W4ADB and W4AKI. W4AKI is also an A.A.R.S. W4NC has a WE 211 in tptg, using 750 volts. W4WS handled American Red Cross messages. W4AEM stayed up all night nursing his transmitter. W4TK says "uh wuh" (Amos and Andy), "Hooray for the new SCM?!" W4AER, is trying to make a '45 do what a 211 should. W4RU is on now and then. W4AEA is on at Cocoa. W4WS's phone set uses type '27 oscillators, '24 buffers, '10 power amplifiers, '50 modulators, all in push pull, with '30 speech amplifier. Ray Ogden, at Palatka, threatens to get on the air soon. W4ABL and W4AMQ both come in on 3500-kc. band. W4ANF is trustee of the U.S.N.R. Force station at West Palm Beach, with call W4ALF. W4SQ, Route Manager in the Tampa territory, is an ex-Navy first. W4DU is on morning and night. W4PK and W4UK are on 3500-kc. 'phone. We don't hear W4ER on since the death of his father. W4NN has an MOPA. Plant City Radio Club, W4AQT, Donald T. Hawley, Trustee, has been issued ORS certificate No. 20. The Jacksonville Amateur Radio Operators Club has a membership of approximately 35. This Club has received A.R.R.L. permission to sponsor a Southeastern Division Convention, to be held in Jacksonville in September, 1931. Keep this in mind, fellows, and make your plans to attend. W4JO handled 93 messages. W4AQT is on all night every Friday. Will all amateurs in the State please send me a report, either by mail (preferred) or by radio, to reach me not later than the 16th of each month, setting forth their activities for the preceding 30 days? We want more Official Broadcast Stations, Official Relay Stations, and Official Observers. Can you qualify?

Traffic: W4QL 33, W4AGN 71, W4ABF 22, W4AQT 6, W4ZU 10, W4JO 93, W4NC 6, W4AER 4, W4TK 3, W4AEM 3, W4WS 25, W4HY 12, W4DU 42.

WEST GULF DIVISION

NEW MEXICO — SCM, Leavenworth Wheeler, Jr., W5AHI — W5AUW well deserves his new ORS ticket. W5AJL has recovered from an attack of YL-itis. W5JZ says "hello and good bye!" W5EF has moved to San Angelo, Tex. Good luck, OM. W5AHI's new dynatron is the answer to a ham's prayer. Hi.

Traffic: W5AHI 312, W5AUW 25, W5AJL 12, W5JZ 3.

NORTHERN TEXAS — SCM, Roy Lee Taylor, W5RJ — W5AUL leads the section this month. W5RJ has been pretty busy. W5ARK is hamming in the daytime. W5BII is a new ORS. W5AL reports for the Greenville gang. W5DW is putting in crystal on 3.5 and 7 mc. W5RZ is experimenting on 28 and 56 mc. W5BLN wants several good schedules all over the state. W5ARV complains of school work. W5QU has a crystal going now on 14 mc. W5BTB is pushing out a wicked signal. W5AAE is working DX. W5WW made a fine showing in the recent tests. W5ALA is figuring on selling out for lack of time to operate. W5HY has moved. W5BND is keeping schedule with W5AGU daily on 3.5-mc. 'phone. W5BAD was supposed to start work for W.U. at Ft. Worth, but he hasn't showed up yet. Hi. W5AZP is doing nice work on 3.5-mc. 'phone. W5GZ is busy at school. W5AIJ is a new one at Ennis. W5RH is trying to make a good receiver. W5ALA is going to *rebuild again*. W5CF has been off this month. W5ASP's ORS and OO are cancelled due to not reporting.

Traffic: W5AUL 69, W5RJ 63, W5ARK 60, W5BII 53, W5AL 42, W5ARV 25, W5QU 24, W5BTB 18, W5AAE 14, W5WW 13, W5ALA 9, W5HY 9, W5BND 8, W5BAD 6, W5RH 3, W5LY 1, W5BLN 26, W5AZP 7.

SOUTHERN TEXAS — SCM, H. C. Sherrod, Jr., W5ZG — Houston: W5BKW has finally decided to return to 3500-kc. CW. Hunt is on 7000 kc. with CW. W5TG has temporarily forgotten 3500-kc. 'phone. W5TD has capitulated and changed to 3500-kc. 'phone. W5ANW is on constantly with 'phone. W5BHO is still working on his 3500-kc. 'phone. Due to school QRM little is heard from W5LP. W5BOC is rebuilding. W5BML is silent. W5LB is getting out well. W5BTD now has a limited broadcast license. W5CA is on 7000 kc. W5AZR has moved to his new home. It is surely good to see W5VK back with us. W5EI recently worked VK3KA. W5VA now has the 500-watt crystal rig going. Clyde Skinner is a newcomer in the bunch. He has the call W5AVU. Dodge is keeping W5YG hot at Rice Institute. Galveston: W5AUX is heard occasionally. W5AVC is also on intermittently. W5BQJ is still making and breaking equipment. W5ARR will have his crystal rig going shortly. Galveston amateurs will please keep watch for an unlicensed station signing the call letters W5AHL on 3500-kc. 'phone. W5BTK gets out well. The Galveston Amateur Radio Club is doing some good work for amateur radio. Corpus Christi: W5AB is busy at KGFI. W5MS has been very busy with the Fourth International Relay Contest. Rosenberg: W5PU is having considerable trouble with QRM from power lines. San Antonio: W5AYR is on 7 mc. The San Antonio Radio Club is going strong. El Campo: W5ACT has been keeping schedules with W5BTH. Austin: W5CT is a newcomer. W5KA is also on with 3500 kc. Flatonia: W5AJD sends in a nice report. There is a bunch of new hams coming up in Flatonia, among them W5ACR. Beaumont: Another newcomer shows up, O. F. Hill, Ex-9DUL of Minneapolis, Minn. Hill will be using 15-watts crystal control. Baytown: W5DS is conducting code classes for prospective hams. W5DS is being entirely rebuilt. Mrs. W5DS will be going soon. Suggest that you QSO Mrs. W5BKG for all the latest recipes, styles, etc. Huntsville: W5ABY is a new ham. Wayland Groves, Ex-W5NW, now PK5NW, is listening on the 7000-kc. band in Sumatra, Borneo, D. E. I. Notify the

Houston Amateur Radio Club of any reception of signals from PY5DJ who may be operating below the low frequency end of the 7000-kc. band. How about some one in the following cities giving us some dope? Port Arthur, Richmond, Schulenberg, Brownsville, El Paso, Beaumont, San Antonio, Austin, Galveston, Laredo, McAllen, Presidio, Alpine, Bryan, Kerrville, and New Braunfels.

Traffic: W5ACT 12, W5EI 67, W5AYR 58, W5CT 21, W5AB 26, W5MS 120, W5BKW 14.

OKLAHOMA — SCM, Wm. J. Gentry, W5GF — W5ABK of Wichita Falls, Texas, visited the SCM and some of the stations in Oklahoma City. W5QL handled some traffic from IPH. W5VQ and the boys are off for a few days due to licenses. W5BPF worked a K6. W5ASQ hopes to get his crystal going soon. W5OJ is one of our new OBS. W5AMC is trying to get the chirp out of his note. W5AHV has his push-pull perking now. W5ASQ has a code class each week. W5BOE needs a few more schedules. W5PL blew a tube. W5AIR plans on moving to Oklahoma City. W5ALF says things are slow with him now. W5ALD blew his plate transformer. W5AYN and W5SW are perking right along. W5ASH is a new station in Tulsa. W5AYF hasn't much time any more. W5BPM is trying to get a PDC note. W5AFH will be on the air soon. W5APY is a new station in Shawnee. W5MM is on 14,000-kc. 'phone. W5ABO is building a 14,000-kc. 'phone. W5APG hopes to have a Naval Reserve rig on soon.

Traffic: W5AMC 250, W5OJ 90, W5PL 76, W5GF 26, W5BOE 23, W5AIR 22, W5BPM 20, W5ASQ 20, W5ALF 11, W5AHV 7, W5QL 7.

CANADA

It gives us great pleasure to comment on the fine work of the Maritime boys during the heavy sleet storm of last February. I have been asked to extend to them the appreciation and thanks of a commercial company for the very fine coöperation and good work done during the emergency.

Look in May *QST* and note that there are six Canadians in the BPL. A record for Canada! Keep up the good work during the summer.

Kindly let me have your response to my question in the May issue regarding ALL CANADA NIGHT.

CANADIAN GENERAL MANAGER
ALEX REID, VE2BE

MARITIME DIVISION

NOVA SCOTIA — SCM, A. M. Crowell, VE1DQ — VE1DR is high traffic man this month. VE1BR worked a "G" with 45 volts "B" batteries. VE1AX keeps nightly schedules with VE1AZ and VE1BN on 'phone. VE1AS has the new M.O.P.A. going strong on 14 mc. VE1AW has completed new hi-power supply using type '66s. VE1CC has been off for few weeks. VE1BL is going strong on 14 mc. VE1BM in recent QSOs with Halifax got the dope re the CONVENTION. VE1BW is getting out great on 3.5 mc. VE1DQ worked G6WN for one hour solid on two-way 14-mc. 'phone. All roads lead to HALIFAX, June 19th and 20th. SEE CONVENTION ANNOUNCEMENT ELSEWHERE THIS ISSUE.

Traffic: VE1DR 272, VE1AX 102.

ONTARIO DIVISION

ONTARIO — SCM, C. D. Lloyd, VE3CB — VE3GT has the lead again this month. He paid a visit to Headquarters. VE3ZZ is off the air for a few weeks. VE3HN is looking for a few more schedules. VE3TM has come through with a fine report. VE3GK is installing a new receiver. VE3CD is a new applicant for ORS. VE3FD reports traffic conditions improving on 3500 kc. VE3ET sends in a newsy report. VE3IB is a veteran of the Great War. VE3LD is a newcomer. VE3AG announces a new Junior op., feminine gender. VE3HY, VE3CI, VE3HK and VE3BD are working consistently. VE3AR-BH are busy on a multi-stage job. VE3BO is working CFV at Goose Island. VE3FC is piling up a beautiful string of DX. VE3CE does not expect to be on much from now until the end of June. Mr. and Mrs. VE3DW are still having a barrel of fun. VE3LM files his first report. VE3HQ is another new ham reporting. VE3HM is a third new-comer. VE3AU is looking for some one who will accept a challenge to a game of chess or checkers via radio. VE3DB is looking in the direction of the 'phone bands. VE3TM says that he has been operating a station since 1927. He sends in a fine report.

Traffic: VE3GT 349, VE3ZZ 203, VE3CD 95, VE3LM 33, VE3AU 22, VE3DB 22, VE3CE 16, VE3AD 14, VE3FD 13, VE3GK 10, VE3HN 8, VE3BC 7, VE3DW 5, VE3HA 1.

QUEBEC DIVISION

QUEBEC — SCM, Alphy Blais, VE2AC — Our star station is VE2BB. VE2CA and the XYL have been piling up DX records. VE2CL tried 14 mc. VE2AP is planning a new 3.5 mc. and 14 mc. 'phone set. VE2AC was very busy with 28 mc. tests. VE2BE was working very hard getting things ready for the Board of Directors' meeting. Would you be interested in having a Quebec Division Convention early next fall? If so, let me know as soon as possible. VE2BO, VE2CO and VE2CU are at present writing their examinations. VE2AP has just completely rebuilt. VE2CX has been operating on 14 mc. VE2CP is closing down after a very successful year. VE2DX is a newcomer, whose call was formerly VE3XK. VE2CM has finished his power supply. VE2EM reports his first traffic handled via 3.5 mc. 'phone.

Traffic: VE2BB 129, VE2AC 96, VE2CA 48, VE2AP 49, VE2CP 32, VE2EM 12, VE2BE 17.

VANALTA DIVISION

ALBERTA — SCM, G. F. Barron, VE4EC — VE4BJ was QSO VK, ZL and was called by a Finlander. VE4EI handled some traffic for the A.P.P. VE4DT's schedules with the Arctic are still FB. VE4EA reports QSO with VK and ZL. VE4CY is giving 'phone a rest. VE4IT and VE4HQ are getting out well on 'phone. VE4HQ is a new ORS. VE4AH has the bug once again. VE4IZ blew his receiving tubes. VE4FR reports ND at his shack. VE4EC is using T.P.T.G. VE4BV hooked a ZL.

Traffic: VE4EI 34, VE4DT 16, VE4EC 16, VE4CY 3.

BRITISH COLUMBIA — SCM, J. K. Cavalsky, VE5AL — Prince Rupert hopes to have a 'phone station as soon as VE5GT gets his heap in shape. VE5EM is QSO VE5DX. A new ham, VE5EI, is located at Usk, B. C. VE5AC reports plenty of DX. VE5AM copped the traffic honors. VE5DD says there's more DX than ever on 7000. VE5AM is working on a push pull. We are very sorry our old friend VE5BP is leaving for England. VE5CF reports better conditions. VE5BC is already to go again. VE5AK is selling out. VE5FI sold his heap. VE5EH is a new call heard on 7000. VE5BM got the odd message, VE5BR lost his schedule with Vancouver. VE5HP is on with a low-power M.O.P.A.

Traffic: VE5AC 9, VE5AL 21, VE5CF 4, VE5FI 4, VE5BM 4, VE5AM 55, VE5BR 5.

PRAIRIE DIVISION

MANITOBA — SCM, A. V. Chase, VE4HR — VE4AR is getting out well on 'phone on 14 mc. VE4BQ is the first station in this section to make the W.A.C. Activities at VE4DK, VE4AE and VE4FP were curtailed due to University exams.

Traffic: VE4AR 32, VE4BQ 18, VE4DK 12, VE4HR 6, VE4DJ 2.

SASKATCHEWAN — SCM, W. J. Pickering, VE4FC — One old timer returns to the air after five years and thinks the old spark sigs sounded far better than the present RAC. VE4HK, A. L. V. Platt at Glaslyn is the OT and would like to hear from some ex Marconi fellows. VE4BB has rebuilt his transmitter. VE4CV has worked four continents. VE4BA has a hobby of blowing filter condensers. VE4IH has been building a transmitter for Gravelbourg College. VE4GR reports seven new hams and an amateur radio club in Saskatoon.

Traffic: VE4BB 33, VE4CV 26, VE4BA 18, VE4IH 13, VE4GR 12, VE4AV 4, VE4AT 2, VE4CC 2.

• I. A. R. U. NEWS •

Devoted to the interests and activities of the

INTERNATIONAL AMATEUR RADIO UNION

President: H. P. MAXIM *Vice-President:* C. H. STEWART *Secretary:* K. B. WARNER

Headquarters Society:

THE AMERICAN RADIO RELAY LEAGUE, West Hartford, Conn.

MEMBER SOCIETIES

American Radio Relay League
Asociacion E. A. R.
Associazione Radiotecnica Italiana
Canadian Section, A.R.R.L.
Deutscher Amateur-sende-und Empfangsdienst
Experimenterende Danske Radioamatorer
Lwowski Klub Krotkofalowcow
Nederlandsche Vereeniging voor Internationaal Radioamateurisme
New Zealand Association of Radio Transmitters
Norwegian Radio Relay League
Radio Society of Great Britain
Rede dos Emissores Portugueses
Reseau Belge
Reseau Emetteurs Français
South African Radio Relay League
Sveriges Sandareamatorer
Union Schweiz Kurzwellen Amateure
Wireless Institute of Australia
Wireless Society of Ireland

ACTIVITY on the 3.5-mc. band during the past winter increased to a point where it compared in international significance and national utility with the overloaded higher frequency bands which have been forced to carry the heavy amateur international communication for the past six years. Relief has come to the higher frequencies in some degree because of this increased low frequency activity, but it has also brought about increased QRM in the 3500 kc. band which reduces its usefulness as an internal local distance band.

Apparently appreciating this, the N.V.I.R., which in the past has been denied use of the 1.75-mc. region, has farsightedly applied for the opening up of this band, just as other national amateur societies have and are obtaining use of 3500 kc. Where the latter has already been done, the next step for amateurs in those countries not yet permitting their use of 1750 kc. is an obvious one: acquisition of the right to operate in all our amateur bands, the lower frequencies as well as our jealously guarded higher ones.

This has two effects. First, of course, it opens up additional highly useful frequency ranges for amateur contact. Second, it solidifies our international position with regard to legislative and regulatory conferences, since it shows we make use of and require all of the frequency assignments now reserved for us under the terms of the Washington Convention. Moral: Obtain and use every amateur band.

— - - - —

Formation of a Rag-chewing Club of Europe last fall has already resulted in a great deal of continental interest and an increase in the amount of friendly conversation at each QSO. President of the organization is K. S. Sainio, OH2NM; secretary, Willy Blaschek, UO3WB; and official announcer and organizer, C. A. Gehrels, PA0QQ.

— - - - —

There are several changes and corrections to be made to the list of QSL Forwarding Bureaus of the world which appeared in the February issue of *QST*.

FIELD DAY IN AUSTRALIA!

The Victorian Division turns out en masse, and here is the party which found the hidden transmitter. Wm. Wonder, Pres. of the Division, is holding the loop, while Allen Stow, VK3AS, is about to be hit on the head with a Columbia dry cell. Others unidentified.

George F. K. Ball advises that he is now the QSL agency for Kenya Colony, and should be addressed: Gov't Radio Station, Mombasa, Kenya Colony, East Africa. His call, by the way, is VQ4MSB.

Cards for Iraq can go either to K. S. J. Rancombe, YI6KR, W/T Station, R.A.F. Diana North, Iraq, or to C. Curtis, YI1CD, R.A.F., Mosul, Iraq.

The new address for QSL's and correspondence of the Experimentating Danish Radioamatorers is: Box 79, Copenhagen, Denmark.

(Continued on page 70)

• CALLS HEARD •

ST2D, EX-ST6HL, I. E. Hill, 47 (B) Sqdn., Royal Air Force, Khartoum, Sudan

14-mc. band (November, 1930)

ct1aa ct1cw d4wao d4wer ear21 e12b f8ex f8aly f8nkt f8cs f8pz f8eo f8bf f8fo f8ru f8rhm f8rj f8fem fm8bg fm8eor g2ex g2cj g2ao g2vq g2dz g2ma g2ux g2dh g2lz g5ml g5yk g5by g5qf g5jc g5qv g5vb g5vm g6ta g6qb g6wt g6hp g6xn g6up g6nf g6rh g6wy g6lk g6xq g6dh g6zb haf3d j1ec k4kd lu1ca lu2ca lu1jm lu3de nkf on4fe on4fq on4fp on4jj on4ar ok2si ok3sk os5a pa0qf pa0da pk3bq pk4aj su1aa su8rs st2a st2c v1yb ve4af vk3wx vk3go vk3wl vk2jp vk2yk vk4gk vk5am vp2sra vp3er vp3rr vp9er vq2ba vq2ty vq3msn vq4cre vq4erf vq4msb vs7af vu1sc w1caa w1aqt w1akc w1axc w1ae w1axa w1zz w1ahx w1aao w1mo w1zo w1bje w1bj w1axv w1au w2but w2axg w2cfo w2ano w2bak w2anu w2naw w2rd w2bdh w2ary w2bml w2arb w2tj w2un w2ae w2bd w2sbt w2ajj w3ej w3jr w3de w4aik w4ft w4bc w4ja w8chq w8aud w8cpc w9adn zs4m zs1b zs5u zs2n zs6y zu1d zt1t zt6s zl1aa

7-mc. band

au7cd au7kah ce1ah eu4ko ear2 ear104 f8kwt f8pm f8joz f8bf fm8re fm8ldc g5pj g6rb g6lh g6qb g6lk hb9q on4jm on4gn on2va pa0fb ts4sbr vk4dw vk4rm w2bds w4gw w8wk w8cf

14-mc. band (December, 1930)

ct1aa cx1af d4nrg d4wao d4lrm ear16 fm8ih fn2c f8cs f8ex f8eo f8rj g2vq g2ay g2nu g2kf g2lz g2gm g2cj g2cx g5by g5ay g5ml g5qv g4bz g6lk g6hp g6nf g6wl g6xn g6up g6rg g6rb g6xq g6ll g6cr g6wt haf8c lu3de lu4dq lu8dy oh3na oh2og on4fq on4jb on4jj on4uo on4jc on4fe ok1au ok2op ok2va ok2si nn1sc pa0xf pa0dj pa0da pa0fp pa0mu pk1cx pk3bq py1ah py1cl py2ay py2bf py2bk py2hc py2qa py2az py9hc su8rs vq4crf vq4msb vq3msn vq2ba vq5nta vp9sr vp2sra vp2sr vs3ac vs7ap vk2lr vk2pr vk2cs vk3xi vk3oc vk3ja vk4aj vk4rj vk5am vu2pn vu2ps vu2ah vu2fx uo1fh uo1fs vo1cm w1zo w1ae w1aao w1lz w1aif w1bxg w1ayf w1bfs w1fs w2zg w2eqo w2nd w2and w2bjg w2aoe w2ais w2buy w2aub w3sc w3bme w3mb w4ft w8chq w8dlb w8bbl x4m x9a yi1co yi1l yi6kr yi6ht zs5w zs1b zs4m zs2n zs6y zt1t zt6j zt2b zt2c zt6x zt1r zu6a zu1d zu6s zc6jm

7-mc. band

ar8foy au7kae ct1aa ct2ac d4nkm eu2bg eu2kbx eu2msk eu2km eu2kme ear96 f8rs f8prw f8wok f8pz g2pp g2zp g5bj haf6b haf3ag hb9q oxxe xon4wm on4fe ol5a(?) sp3cy sp3ar sp3dr ts4sac w4abt yi6kr vk3wl vk5am vk3uk vs6ah zc1s zs5w

QRA, Kapoeta, Southeast Corner of Sudan

14-mc. band (January, 1931)—Portable

ct1aa d4rzn f8eo f8ex f8swa f8pz f8pm f8tv f8whg f8rj fn2c g2ay g2cj g2kf g2ol g2sw g2vq g5by g5is g5jf g5yk g6da g6hp g6rb g6rg g6vp g6xq haf2d haf6b oa4j oh3na on4jb on4fe on4jc ok2co ok2ak ok2si pa0za pk3bq pk4aj pk4hh pk1cr un7dd st2c su1aa su1aq su8rs vk2lr vk2jp vk2hu vk3oc vk3uk vk3ol vk3nm vk5wr vk5gr vk6fy vk6fm vk7eh vs2af vs7ap vs7ai vs7gj vq4cre yi6ht yi6kr w1asf w1aln w1afo w1bux w2lz w3adz w4ft w8afq ze1jh ze1jg zs1b zs4m zs6y zt1t zt2c zt2e zt6j zu5b zu6a

7-mc. band

ar8mo au7kal ear98 ear104 f8pz f8ej f8hr f8pm f8wok fm8eor g5bt ka1sl ka1za sp3ar pk3bq vk2ts vk3wl vk3bw vk6fy vk6mo vk6fl vu2kh w1axf w1abl w1sz zc1s zs2z zu5b

14-mc. band (February)

ct1aa f8rj f8swa f8pm fn2c g2ay g2vq s5tk s6wy s6nf haf6b he1fg lu3oe ob5kz ok2va on4uu pk4hh su1aq yi6ht yi6kr vq2ty vu2pn w1bw w1rmx w2amb w2od w2amr w2baf w3gp w4eg w5lq w8cko zt2c zt6j zs4m zs2c zo6w ze1jb ze1jc zc6jm

7-mc. band

aux2fx ct1cw earco f8pm f8pz f8dot fm8eor g2dc g2lz g5by g6lk hb9q i1ll j1dr ka1za ka1sl ka1ce ka1su ka1pw ka1c ob8k2 on4dj ok2zz pa0fp pk1cr pk1co pk3bq ts4sbr vk5zk vk5wr vk5dq vk5hg vk6mo vk6fl vk6la vk6by vk6ow vs1ab yi6kr w1mx w1bk w1lz w2cuk w2ans w2bti w2azo w2ais w2amr w4ft w4lm w8cna w9crj zu6w

OM2CS, C. R. Spicer, Agana, Island of Guam, M. I.

14,000-kc. band

au1ai au1ao ce3ch cr7am cr9cn d4yab d4fwe d4abg f8pz f8ex g5ml g5yg g5bj g5py g5vm lu3de lu2am lu9bv lu8dj lu4dq lu8en lu9dt oa4y oa4q on4j oh2pp oh5nd oh7nf oh5ng oh2ow oh7nb oi1co ok2ag ok2af ok2op ok2zz on4jb on4jc on4bc on4aa on4gn oz7hs pa0qf py2ii py2bn py2az py2qa py2bq sp1kx sm7yg ti3xa uo2op uo3wb ve5aw ve4cv vp1ff w0ecn w6bax w8bwm w8ay w0fey w6ejc w5tw w7df w7fs w7di w9gv w9bnh w9ld zu6w zu5dj zt0x

VK3CX, Alan G. Brown, 8 Mangarra Road, Canterbury E7, Victoria, Australia

14-mc. band

w1bwa w1mo w2ais w2ajb w2bak w2cjx w2jn w2qf w2qa w3bwl w3ej w4akt w5bek w6akd w6ama w6aog w6bax w6bcx w6brv w6bsk w6bto w6bww w6cwh w6dgg w6dos w6dwi w6dyv w6dzy w6edt w6egh w6eop w6eqb w6ih w6qv w6sa w7kq w8bti w9cgm w9cku w9dex w9ghh ac9gh ce1as ce3ab ct1aa d4abg ear21 f8da f8ex f8gdb f8pz f8whg f8wrg g2cx g2vq g5bz g5ml g5yg g6rg g6vp g6xq he1fg he2jm j1do j1dr j1ds j1dy j1ec j2cb j2pk j3sa ka1cm ka1sl k6bhl k6dmm k6erh lu8dy oa4j oa4t oa4z oh2og oh3na oh7nb ok2ny ok2op ok2rm ok2si oz7t pa0jv pa0zf on4au on4uu pk1cx pk1hr pk2wj pk3bm pk3bq pk4aj pk4bo pk6aq py1ah st2c st2d su1aq su8rs ve2ac vu2ah vu2bg vu2fx vu2pn vu2sx vs3ab vs6ag vs6ah vs7ai vs7ap x1a x9a x9b xf7c xu2uu xu5wa

7-mc. band

w1asf w1afv w1ben w1bkf w1cgf w1ch w1mx w1sz w2abw w2ans w2az w2boz w2cht w2gg w2wz w3bbb w3bes w3bfc w3bhy w3bm w3hy w3gt w3wz w3zzb w4akg w4alm w4anf w4lt w4ly w4ft w4rx w4zh w5abk w5afx w5bg w5de w5fw w5jc w5lb w5ld w5ms w5ql w5qx w6ahk w6alu w6am w6amm w6awy w6rx w6ash w6bck w6bem w6bht w6bkm w6bpw w6buo w6byb w6bwi w6bzo w6caj w6ceo w6cgm w6cqz w6cro w6csi w6csj w6czk w6car w6eb w6eep w6efr w6elc w6emk w6ew w6gf w6hm w6io w6qt w6tm w7acy w7dp w7fv w7hm w7jb w7na w7qi w7rt w7rv w7qf w7u w7wq w7zzg w8ano w8bau w8baz w8bcj w8bky w8bgy w8ejo w8dfe w8mk w8od w9axh w9ces w9cfr w9dti w9eik w9gv w9mi w9um wlj1 wsq ac3al ac3gb ac3ma ac8ad ac8ag ac8hm ac8na ac8tj ac9gh ar8fdy au1cc au1nz au1kah au7kal ct1aa ct1eq ct2ac cv5ak daiv d4uan earco ear21 ear52 ear94 ear98 ear125 f3ceb f8eo f8pz fm8eor frear75 g6pa hb9h hb9q he1fg i1ev i1ll j1dh j1dm j1do j1dq j1dr j1dv j2wv j3di j5cc k6aja k6boe k6ccs k6cmc k6cdd k6dmm k6etf k6exp k7akv k7aml k7ox k7qs ka1cc ka1cm ka1co

kalcz kaldj kalhp kalhr kaljr kalpw kalsl kalsp kalxa kalxc ka4hw ka9pb kn2 om1tb om2cs pk1co pk1cr pk1vh pk3bq pk3pr ve2cp ve3bc ve4dj ve5al ve5co vo8mc vp1ws vu2kh va6ae va6ag va3ac ya1x xau1zb xd4abv xf7c xha xw6abd xx3bmd xps

DE939, Karl Wirtz, Cologne, Hoelderlinstr. 18, Germany

14-mc. band

w1asf w1apq w1afu w1ahk w1ala w1ack w1ajm w1akv w1avl w1azs w1adp w1biu w1bte w1bnj w1cpb w1cmx w1cel w1ev w1fh w1ifu w1mo w1mp w1ry w1zy w1wv w1zy w1mk w2bxt w2ku w2bwd w2bk w2gb w2amr w2vo w2aco w2bwd w2bjd w2ir w2fd w2cuq w2agq w2jd w2bsr w2bta w2agx w2adp w2aoi w2alu w2agg w2rs w2ahz w2ego w2baa w2mb w2ekr w3buy w3ajd w3hg w3ejn w3gp w3vx w3nm w3wx w3bq w4ahk w4dc w4ok w4et w5mm w5ad w7ek w8adm w8ccw w8ue w8cpe w8cga w8ben w8bot w8bwk w8czp w8box w8ai w9adn w9dgt w9ecz w9gv au1ck aulai au2bh au7ch ap6jm cm2sh cm8uf cr7am cr9cn cx1af kalce kaljm kalza k4bpf k4kd lu3fa lu4dq lu9dt om2cs pk4hh py1cm su1ch tf3tp ve1bl ve1dq ve1al ve1dr vk2xy vk2hg vk5hg vo8mc vs6ae vs6ah vs7gj vu2ah xyi6kr zc1s zeljg zllfv zllca zs4m zt1t

3.5-mc. band

w1by w2zk

VK2WD, 43 Arundel St., Forest Lodge, Sydney

7000-kc. band during February and March, 1931

w1rq w1km w1zj w1ala w1fm w1az w2az w2bmm w2ano w2rk w2ans w2ebw w2cg w2za w3asm w3zk w3aou w3lyk w4dc w5aot w5lq w5bbv w5bfl w5rj w5bbq w5jc w5ql w5lb w5ms w6dtt w6eqj w6uc w6byb w6bif w6ahp w6uz w6dri w6eif w6dwi w6efq w6ew w6bht w6emk w6ahk w6bjl w6ehe w6bkm w6cul w6af w6edj w6bqs w6ihk w6adt w6byy w6eep w6car w6egh w6bqj w6ozk w6exq w6ac w6qt w6lx w6by w6edt w6eqb w6ezg w6bqc w6biz w6eze w6qp w6eig w6azv w6ffp w6ody w6exw w6crn w6bdn w6am w6ea w6ahz w6mhp w6eak w6pe w6cri w6azh w6dop w6tm w6bbo w6dev w6dtz w7cs w7td w7ks w7gs w7lk w7ahp w7rt w7afo w7bb w7zzg w7pb w7kq w7kk w7df w7dl w7ts w7kk w8bkp w8baz w8dqv w8ajv w8cfp w8adg w8gz w8ath w8bet w8bky w8bnb w9mi w9aio w9ces w9um w9anq w9oj w9eta w9evd w9ecz w9ka w9gv w9eap w9ga w9esb w9esn w9dgz w9jl w9arn w9tl w9enq w9dng w9adn k6dmm k6dud k6ces k6epw k6emc k6btr k6vg k6agi k6etf k6ed k6erh k6axk k6erw k6co k6oa k6ene k6bo k6cog k6dju kalrt kalhr kalsl kalpw kalxc kalel kalce kaljm kalag kalnf cm2xa pk3bq pk1cr ear21 vp1ws vp1aw om1tb om2cr lefh hk1aa ka4hw ka9pb ac8go aulnz j3cs f3ocb

G6YL, Miss B. Dunn, Felton, Northumberland

7000-kc. band

w1bri w1fm w1mx w1sz w2aj w3hy w4oc w5bbq w5jc w9um xw5lm xw7eff fm8cr fm8eor fm8ih fm8jo fm8mst cn8eis kalhr kaljr kalpu kalpw kalsl kalxa es3jr xoh5an ry4a tf3tp yl2el veldu vs1ab yi6kr ap6jm xx3bmd xsvld xlcmv

14,000-kc. band

w3ebv w3pf cn8jbt cn8mop ve2ac zt1t zu6w

W1AFU, R. Bassett, and W1APL, A. Roncalli, Springfield, Mass.

w6ac w6aj(fone) w6am w6de w6ec w6ek w6he w6hy w6id w6jy w6kx w6ln w6sa w6ud w6ul w6vh w6vq w6vz w6yh w6yv w6aeo w6aix w6alp w6alw w6ama w6aoe w6aqj w6arl w6atw w6awa w6awz w6bam w6bax w6bck w6bdf w6bde w6bgf w6bin w6bjc w6bjf w6blp w6bsv w6bto w6bvc w6bvy w6bvz w6byb w6bys w6byz w6bzc w6bzd w6car w6ced w6cgx w6cht w6cii w6cin w6cix w6cle w6cpm w6csj w6cuh w6cul w6cum w6cwt w6cyr w6csz w6dak w6dbt w6deg w6dev w6der w6dgg w6dhd w6dhp w6dmn w6don w6doz w6dpj w6dtj w6dtz w6dui w6dwi w6dyv w6dyz w6dzd w6dzm w6eak w6eam w6eaq w6een w6eeb w6eep w6eii w6ejc w6ejh w6elc w6emd w6emk w6eop w6erc w6ers w6etc w6eug w6eup w6exq w6eyc w6eyj w6ezk w6azg w7cs w7dp w7fi w7id w7kz w7ek w7le w7mx w7na w7nm w7pr w7qf w7qn w7qy w7sg w7ub w7vk w7vn w7wf w7wl w7aah w7aax w7acq w7adn w7afl w7afo w7ait w7ame w7anj w7ans w7aul w7awd w7awv ac8gg b7xbx b7xk ct1aa ct1bx ct1cw ct2ac ct2wn cm1by cm1oe cm2bt cm2sh cm2wa cm2wd cm2xd cm2j cm5cx cm5fc cm8yb cn2 cn8mb cn8rux cw2jt cx1ak ce2ab ce3ch ce3dg d4aap d4uhm d4wer ei8b ei8c ear21 ear37 ear98 ear116 ear136 ear137 erear149 ereari f2iz f8ag f8da f8ej f8eo f8eq f8ex f8hr f8jd f8ol f8pz f8tv f8pv f8xd f8btr f8gyn f8kwt f8swa f8whg fm8cr fm8cfr fqpm ftb g2ao g2ay g2by g2cj g2dh g2ip g2lz g2nu g2sw g2vq g5bj g5by g5is g5la g5ml g5pl g5sy g5vm g5yg g6ax g6bd g6br g6gx g6nf g6pa g6qb g6rb g6rg g6sb g6vp g6wn g6wt g6wy g6xq hc1fg haf2d hh7c hvbx km4 kfr5 kfu5 k4alk k6erh kxsm lu2ca lu3de lu4da lu5ac nn1bx nj2pa nl8mre nl8smi oe2ff oh7tb on4au on4ea on4gn on4hc on4ja on4jb on4jj on4ro on4caa oa4j oa4v oa4z pa6emd pa6fb pa6gg pa6gf pa6qf py1ba py1aw py1cg py1cm py2az pxr pxbb sp3ar ss2ap tg1as ti2hv uo1fh ve1ab ve1ad ve1ah ve1ax ve1az ve1br ve1cc ve1co ve1da ve1dr ve1dw ve2ac ve2bb ve3aw ve3ay ve3co ve3dd ve3dr ve3gt ve3gx ve3hu ve3ll ve3mt ve3oc ve4ai ve4bo ve4bq ve4bu ve4cv ve4dj ve4dk ve4dl ve4dt ve4du ve4ed ve4fx ve4gp ve4gq ve4gu ve4gy ve4hy ve5ac ve5al ve5ao ve5cf ve5cu ve5eg x1aa x1af x1ge x4m x5bo xf7c xf76 xf8qp x9a vk4xi vn2bg vo8s vo8ae vo8an vo8mc zl1an zl1ap zl1fu zl2gh zl2pg zl3aj zl4ba zs1p zs4m zs5u zs6y zt1t zt2c zt5w zu1d zu6n 55k rx1aa eahxnn daiv f8pz f8tu

W2BWG, R. J. Mahler, 152 So. Grand Ave., Poughkeepsie, N. Y.

3500-kc. phone band

w1auy w1bcr w1gw w2asq w2aoe w2brw w2gj w3aex w3alz w3avy w3bae w3bqj w3oo w4al w4anv w4hn w4pw w4mu w4ve w4uk w5air w5apw w5awg w5bie w5kx w5pp w5hn w6abf w6bum w6cne w6cvk w8ajh w8ape w8bae w8bok w8buv w8cpk w8eul w8eza w8edy w8iv w8rl w9axz w9dtp w9edw w9geo w9fke w9etd velax

OH2OG, Frans Mäkelä, Vaasank. 3, Helsinki, Suomi (Finland)

14,000-kc. band

ap6jm au8at cn8mep cn8mb ct2ac ct4ad ce2ab cx1fb fm8mst fm8cr fm8eor fm8th fm8bg fm8lc fm8tui fm8lav fm8ih fm8hs fm8rgb fm8gke fm8smu fm8rit ka1cm lu1ca lu2az lu3de lu3dh lu8dy lu8dj lu9dt pk1cx pk3bq pk4ih pk4aj py1aw py1cl py1cm py1ah py2ba py2bf py2bg py2ay py2ad py9aa py9ab rbx rv1g su8rs su1aq su8wy st6hl st2c st2d ve2eo ve4cu ve5aw vk2hm vk2hc vk2hb vk2hv vk2hu vk2jz vk2fx vk2lr vk3bb vk3qc vk3gx vk3ge vk3xi vk3lb vk3cx vk3wl vk5bm vk6fm vo8mc vq3wx vs3ab vs7ap vu2zx vu2kt vu2as vu2ah vu2dr w1aed w1ae w1akr w1mo w1bwa w1aqd w1axe w1edx w1aao w1ig w1asf w2cko w2bkt w2qt w2jm w2ejx w2aag w2ecj w3buv w3kz xw3ll w4aev w7qf w8adm w8fz w8adm xg1hi xpa0jv xpa0nf yk2xx yi1lm yi6ht yi6dc yi6kr zl1an zl1ar zl2ga zl2gh zl2bx zl2bg zl2dn zl2gs zl1cp zl1fc zl1fw zl3as

W7ABH, Edwin Lofquist, S. S. San Gabriel (WACF), Between Los Angeles, Calif., and Balboa, Canal Zone

7000-kc. band

cm2wa cm2xa cm8yb cp1aa ear4 f8xd k6aja k6db k6dmm k6bvp k7adt lu1cz nn1nic nn1nng rx1aa rx1paa ve3bv ve3cf ve4bq ve4ev x1d x5c zL1fe zL2ej zL4bt w1aso w1axx w1bff w1cg w1cmz w1cpg w1crp w1dw w1ej w1hb w1hz w1mk w1km w1vs w1zz w2abp w2ac w2afr w2akl w2alf w2alu w2ama w2atz w2avj w2azo w2azq w2bcp w2bdr w2bgr w2bjm w2bod w2bor w2bpv w2bqg w2bvx w2bwx w2cel w2cfu w2ckw w2cl w2chn w2ctc w2ctw w2cwk w2czf w2db w2dn w2kt w2ku w2qn w3aer w3aig w3aiz w3aqk w3bat w3bgq w3bip w3bke w3bkk w3blu w3bw w3cic w3gr w3jm w3op w3rj w3zk w4aa w4aak w4abs w4aby w4add w4ael w4aev w4agb w4aht w4ajs w4asj w4dp

(*Continued on page 86*)

• CORRESPONDENCE •

The Publishers of QST assume no responsibility for statements made herein by correspondents.

The Right Idea

75 Proctor St., Salem, Mass.

Editor, *QST:*

I have been a member of the A.R.R.L. for six years, and ever since I can remember most of the space reserved for correspondence in *QST* is taken up with the opinion of one amateur as to the poor operating of another. Thousands of words have been written concerning the fellow who makes long CQ calls; the fellow who says "R R, pls rpt all," etc. It would seem that by this time those who would benefit by the criticism of other operators would have learned good operating procedure.

True enough, some operators are good, some fair, some poor; but what does it all matter after all if the real things that count, such as d.c. notes, steady transmitters and lawful frequency limits are obtained and observed through the excellent instruction and advice given by the technical staff of *QST?*

In the commercial game, we have our "lids" and all the things to irritate us that the amateur has to contend with. But in our case, poor operating means loss of time, and loss of time means loss of money. But even so, one should and can control one's self in spite of these minor things, which after all mean so little and which can make all the difference between a peaceful state of mind and a nervous wreck. I have seen radio men throw phones through windows, heave a receiver half way across a room and do most everything but froth at the mouth when working with another operator who did not know quite as much as they did. But it didn't get them anything.

Very few of us find time so valuable that we can't spend a little of it in smoothing over difficulties that occur when one radio station works another. Then again, the main reason for this letter is to try to make the gang see that space allotted for correspondence in *QST* is too valuable to be used in criticizing others. Let our correspondence be constructive rather than destructive.

— *W. L. Hall, WSL, Ex-W1BMS*

The AB6 Flight

Dayton, Ohio

Editor, *QST:*

Thanks to the radio amateurs, our trip to Miami, Florida, and return was highly successful. We have received many very interesting and very valuable reports from amateurs all over the country. We also worked quite a number of amateur stations along the route.

We have been unable to make a complete list of all of these stations for you up to the present time, but we have fond hopes of sending you a complete story of both of these long trips with extracts from the logs showing the stations worked and heard and with photographs of the airplanes, equipment, and the personnel.

Thanking you again for your and the amateur coöperation in general, I am

— *Tom C. Rives, Captain, Signal Corps, Officer in Charge*

The Solar Cycle

Wakotipa, Botemans Road,
Gladesville, N. S. W., Australia

Editor, *QST:*

Re sunspot influence on radio communication and the eleven-year cycle of variation (Feb. 1930, *QST*) it occurs to me that such variation (if any) is not directly attributable to solar influence, but indirectly through the eleven-year cycle of change in the earth's magnetic field.

It seems conclusive that electromagnetic waves should be influenced by changes in the magnetic field through which they travel, and a good case seems to be made out by considering some of the other variations in terrestrial magnetism:

1. The 960-year cycle.
2. The 11-year cycle.
3. The annual variation.
4. The daily variation.
5. Variations due to magnetic storms, aurora borealis, aurora australis, etc.

Leaving the 960-year cycle to subsequent generations (hi!) it is now generally conceded that there is an eleven-year cycle of variation in phenomena relating to radio communication, while the annual and daily variations and those due to magnetic storms, aurora displays, etc., are common knowledge. I do not know if any research has been carried out on these lines, but would suggest that it is most desirable to endeavor to relate the two.

Observations in terrestrial magnetism date back to 1580. Accurate forecasts are possible, and if any relation can be established it should prove most helpful. This is no job for an individual, but for a large number of experimenters collaborating with magnetic observatories, and I would suggest this as a problem for the Experimenters' Section.

— *T. R. W. Biesbley, VK2TW*

TO PERFECT THE FILTER CIRCUIT

Single hole mounting

One-piece anode

Vent-metal enclosed

Dull Nickel Can

1931 witnesses the definite triumph of the SPRAGUE INVERTED TYPE ELECTROLYTIC CONDENSER which is now specified by most of the leading radio manufacturers, producing the largest volume of radio receivers absorbed by the American public.

No other device can compare with the SPRAGUE CONDENSER for efficiency, economy and performance in the perfecting of the Filter Circuit. Produced with absolute uniformity, Sprague condensers are specified by those who seek maximum efficiency.

Write for illustrated booklet, diagrams, etc.
Department

SPRAGUE SPECIALTIES COMPANY
North Adams, Mass.

Small Space

High Capacity

High Voltage

Self-Healing

SPRAGUE
Electrolytic CONDENSERS

Jewell Radio Company

POWER AMPLIFIERS PACKS SUPPLIES **A SPECIALTY**

Exclusive Eastern Distributors for

PURADYNE PRODUCTS

Reg. U.S. Pat. Off.

PURADYNE P.F. 50 power transformer 3000V. c.t. 500 watts in case with stand-off insulators....**$16.00**

PURADYNE P.F. 250 power transformer 1200V. c.t. 2–7½V. windings, 200 watts.....**$4.50**

PURADYNE P.F. 245 power transformer 750V. c.t. 2½V. at 16 amps. 2½V. at 6 amps. and 5V. c.t. 150 watts.....**$3.50**

PURADYNE 280 power transformer 600V. c.t. 2½V., 1½V., 5V. 100 watts.....**$2.00**

PURADYNE 250-mil choke 20 Henrys 110 ohms d.c. resistance in metal case with stand-off insulators. **$3.00**

PURADYNE 30-Henry 125-mil choke 250 ohms d.c. resistance.....**$1.00**

PURADYNE 30-Henry double choke as above...**$1.75**

PURADYNE: Filament transformers 10,000V. insulation in metal cases wit'i stand-off insulators:

2½V. — 12 amps. for 866s.....**$3.50**

7½V. — 6 amps. for 210s, 250s, 281s.....**$3.50**

10V. — 7½ amps. for 203As, 211s, 852s, 860s, 845s. **$4.00**

12V. — 10 amps. for 204As, 212Ds.....**$4.50**

Special Filament Transformers 2–7½V. c.t. — 4 amps. each.....**$4.00**

PURADYNE .002, .006 — 6000V. plate blocking condensers with stand-off insulators.....**$.75**

WESTERN ELECTRIC 1 mfd. condenser 21AA 750V. a.c. test.....**$.50**

ACME Parvolt 2 mfd. 1000V. working, unmounted condensers but sealed in paraffin, guaranteed....**$.75**

FARRAND 1 mfd. condensers 400V.....**$.20**

PURADYNE **guaranteed** transmitting filter condensers metal cased with stand-off insulators. All condensers rated at continuous working voltage:

Capacity	*1000 volts*	*1500 volts*	*2000 volts*
1 mfd.	**$1.25**	**$2.00**	**$3.00**
2 mfd.	**2.00**	**3.00**	**5.00**
3 mfd.	**2.50**	**3.50**	**6.50**
4 mfd.	**3.25**	**5.50**	**9.00**

PURADYNE 200 watt center-tapped transmitting gridleaks in metal case with stand-off insulators:

5,000 ohms	**$1.75**	20,000 ohms	**$2.50**
10,000	**2.00**	30,000	**2.75**
15,000	**2.25**	50,000	**3.75**

OHMITE 150 watt gridleaks — 5000; 10,000 ohms; 11,000 ohms; 16,000 ohms; 17,000 ohms, each...**75c**

PURADYNE mike transformers — guaranteed — neat metal case single button **$1.75** — double button **$3.50**

PURADYNE mike stands: Table model **$2.50**; floor model adjustable to 80 inches.....**$5.00**

NOTE: Jewell absolutely carries the most complete line of power amplifiers and public address systems. Send for literature.

LAST MINUTE BARGAINS

PURADYNE guaranteed 866s extra heavy filament. **$5.95**

THORDARSON 210 power pack complete to work. **$15.00**

EVEREADY Raytheon Photo Electric Cells....**$15.00**

OHMITE 245 tapped voltage divider 18,000 ohms, **$.50**

OHMITE 210 tapped voltage divider 42,000 ohms. **$1.50**

PURADYNE Condenser Block, 4-4-4-2 Mfd. 1000 Volts, working for 250 P. P. Packs.....**$5.00**

We Can Get Anything—At Jewell's Prices—Ask For It

Include postage with all orders and 20% deposit against C.O.D. shipments

Jewell Radio Company

58 Vesey St., Dept. S., New York City

Why Is a Ham?

Festus, Mo.

Editor, *QST:*

Often I am asked just what I get out of ham radio after putting so much time and money into it. Well, one ham would hardly ask another that question. Ham radio has many thrills for me, some of which are:

The OW will give you heck for cluttering up the house with junk.

You will lose lots of sleep and feel like pre-war next day.

You will find out most of your good ideas are duds and most of the good ones are old to others.

Lots of good QSO's will go haywire from fading or QRN and power leaks, and BCL's will keep you guessing.

No receiver or transmitter is good enough and few of them are finished before they are taken apart and changed, all of which takes time and kale.

Oftentimes we give up in disgust and quit cold, tearing up the whole works. But then when we get ready to dispose of the parts we feel ourselves slipping, so put them away carefully and start reading *QST* with renewed interest to see just what is the best we can do with parts on hand and a few new ones, so off we go again — just can't quit.

With about six or seven hundred QSL cards filed away and seventeen hundred QSO's under my belt since 1928 I still don't know why I am a ham — but it may be that letters like the one below coming from one of the boys aboard the U. S. S. *Marblehead* has something to do with it.

The Sweepstakes certificate from last year for the State of Missouri on the wall is an inducement for me to stay on for a while, and the hope of a good QSO with W1MK's new rig will keep me on longer. Then of course I must make the BPL, so guess I will be on for a while.

What keeps the rest of the gang on?

— *C. Herbert, W9CJB*

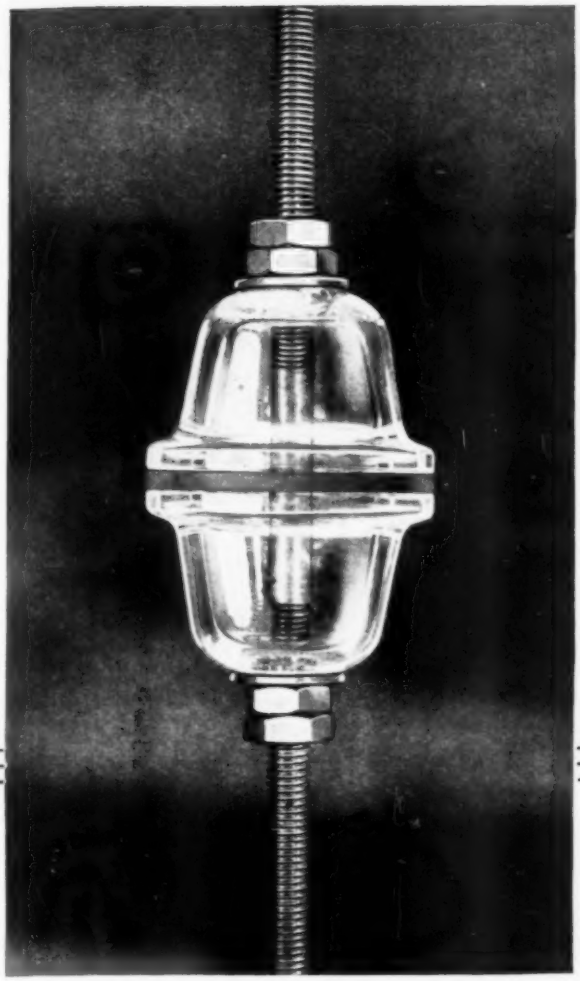
"U. S. S. *Marblehead*, Guantanamo, Cuba

"*My dear Mr. Herbert:*

"Although not knowing you personally it does seem that we pounders of the brass key here aboard the *Marblehead* have had the peculiar pleasure of meeting you often — and it doesn't seem at all true that we are separated by some few thousand miles.

"We sure do want to thank you for all you've done for us — and those messages answered in a short period of two and three days where a letter takes at least twenty to be sent and answered certainly is a big help to us down here away from civilization proper. I do hope our little sked can continue although there are lots of times business will interfere with pleasure. How do you like the idea of a sked with a floating station — seems a bit funny doesn't it?

"Unfortunately I'm not so hot at pounding a key or receiving for that matter but I manage to keep along with you at times when I find the op-



Now Ready

A new practical PYREX Entering Insulator

for amateur use

HERE is a new insulator designed specifically for hams. Two four-inch bowls and a solid brass rod make it easy to handle and install. The high volume and surface resistance and low power loss of PYREX electrical glass result in clearer signals and better distance, particularly under adverse conditions.

Inexpensive, sturdy — the new PYREX insulator comes to you ready for work. It is equipped with jam nuts, gaskets, and washers. The brass rod, solid for easy drilling, is threaded except for 3″ in the center. In two sizes No. 67104 with 15″ rod — $2.20, No. 67105 with 20″ rod — $2.30. A folder describing this new insulator in greater detail will be sent to you on request. Dept. F68 Corning Glass Works, Corning, N. Y.

"PYREX" is a trademark and indicates manufacture by Corning Glass Works, Corning, N. Y.

"If the assassination would trammel up the consequences . . ."

So said Shakespeare. You probably have the same feeling in milder form, when you can't locate that copy of *QST*.

Together with its immediate news value, a current copy of *QST* becomes one of a series of an important file not to be found elsewhere in the radio field. These facts long ago convinced us of the desirability of making available a

QST Binder

(Holds 12 issues of QST)

Note the wire fasteners. Unnecessary to mutilate copies. Opens and lies flat in any position.

$1.50 each postpaid

A binder will keep your *QST*s always together and protect them for future use. And it's a good-looking binder, too.

A. R. R. L.

38 LaSalle Road

West Hartford Connecticut

portunity of getting up to the radio shack and it's a pleasure to hear you.

— *Charles H. A. Robr, Ensign, U. S. N.*

Standard Frequency QRM

Landis, Saskatchewan, Canada

Editor, *QST:*

In my first letter to this column I wish to get rid of some of the QRN that is buzzing around the insulation between my ears by registering a healthy kick against the amount of unnecessary QRM during Standard Frequency Transmissions. Why is it that somebody has to pick that particular time and frequency to start tuning up a cement-mixer with a 25-cycle note that covers 50 kilocycles, or to start a CQ endurance contest? And it might not be out of place to ask why it should be possible to tune on past the final transmission and find a dozen or more amateurs pounding blissfully away, when it might be to their advantage to be calibrating a monitor box or frequency meter about that time.

The men who transmit these standard frequency schedules are not doing it for amusement, but for the benefit of amateur radio and radio amateurs, who would do well to show their appreciation by using them, or at least allowing others to do so by operating on some other frequency while the transmissions are on. The writer in his ignorance in the past may have been guilty of this offense, but now and hereafter when the transmissions are on here is one amateur who is *listening*.

Come on gang! Let's coöperate by reading the standard frequency news each month and applying its information, or pointing it out to the fellow who doesn't read it. For those who won't read it, the Wouff Hong is the only remedy.

— *A. R. Bock, VE4HD*

CQ DX

103 Meadowbrook Road, West Hartford, Conn.

Editor, *QST:*

Somewhat diffidently, in view of the strong talk in your correspondence columns, I venture the suggestion that when a "CQ DX" draws replies from undesired regions the fault lies altogether with the maker of so aimless a call. Forethought would have suggested *naming* the desired region as "foreign," "European" or whatever was hidden in the calling operator's mind.

But for that matter, suppose that a "restricted CQ" *has* been called. Even then it seems doubtful if replies from other regions are proper cause for wrath. The use of the term "CQ" certainly does not suggest activity of any consequence. An interruption can accordingly do little harm and may be most useful to the answering station.

In short, it seems rather presumptuous for the "CQ" caller to proceed as though he were operating a shore station and others mere ship stations subject to his orders. Why not assume that the other man's judgment is equal to your own?

— *Robert S. Kruse*

Permanent *Steady* Tension!

To Resist Vibration

"What," said little Rollo, "is that ship doing, standing on sticks?"

"That ship," said Papa, "was badly shaken up by shock and vibration in a big storm. Thousands of her rivets were loosened, making her leak, and will have to be replaced." "But," persisted little Rollo, "why didn't she sink?"

"Well, you see, Rollo," said Papa, "the engines that drove her and the pumps that kept her afloat were *bolted* fast and *they* didn't come loose. *Tension* kept them tight."

THE CARDWELL MIDWAY

Condenser is necessarily light in construction to meet the requirements for which it was intended, but it is assembled like fine machinery, with watch-like precision. Every sturdy cap-screw and stud is held immovably in place by *tension* and the tenacious grip of lock washers biting into brass and aluminum. Only deliberate tampering will loosen this assembly; vibration, shocks and temperature changes—never.

Such construction is expensive, but all CARDWELL condensers are manufactured with a conscientious regard for *ruggedness* and *strength*, and no expedient sacrificing these qualities to *cheapness* will ever be employed.

. . . LIGHT . . . COMPACT . . . STRONG . . .

CARDWELL MIDWAY CONDENSERS

FEATHERWEIGHT

7 Receiving Sizes 26 to 365 mmfds. . . . . List $2.10 to $3.00
6 Transmitting Sizes 22 to 150 mmfds. . . . . List $2.60 to $5.50

Rotor and stator plates of transmitting condensers have edges well-rounded and are highly polished overall. They are suitable for transmitters using up to 75 watt tubes. Actual airgap .070".

Many sizes and models ot transmitting condensers for high, medium and low power are included in the CARDWELL line, also the famous CARDWELL taper plate and other receiving condensers.

Send for Literature

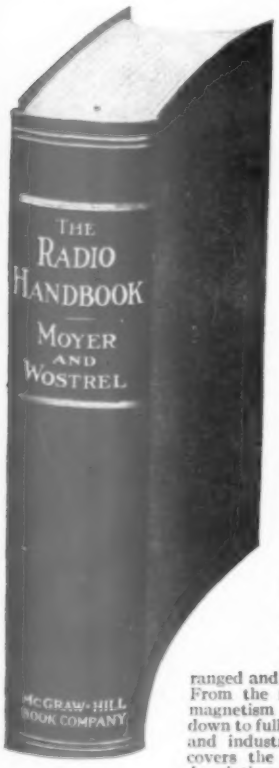
THE ALLEN D. CARDWELL MFG. CORP.

83 PROSPECT STREET BROOKLYN, N. Y.

"THE STANDARD OF COMPARISON"

Just published!

The most important radio book of the year



THE RADIO HANDBOOK

Including Television and Sound Motion Pictures

by James A. Moyer and John F. Wostrel

Both of the Massachusetts Department of Education Authors of *Radio Receiving Tubes, Practical Radio Construction and Repairing*, etc.

886 pages, 5½ x 8, 650 illustrations, flexible, $5.00

HERE at last is a handbook that meets the need for a complete digest of authoritative radio data, both theoretical and practical, in one logically arranged and thoroughly indexed volume. From the fundamentals of electricity, magnetism and electron theory right down to full details on latest commercial and industrial applications, this book covers the whole field of radio, with descriptions, definitions, design data, practical methods, tables and illustrations in profusion.

Over 875 pages of latest data on such topics as

— modern transmitters, Piezo crystal, 100% modulation, etc.
— commercial and amateur short-wave receivers and transmitters, Kennelly-Heaviside layer, etc.
— marine radio equipment, auto alarm, etc.
— automobile radio sets
— all latest tubes, photo-electric cells
— television and sound motion pictures, etc., etc.

See this book 10 days FREE
Send this coupon

McGRAW-HILL FREE EXAMINATION COUPON

McGraw-Hill Book Company, Inc.
370 Seventh Avenue, New York

You may send me **Moyer and Wostrel** — Radio Handbook, postpaid, for 10 days' free examination. I agree to remit $5.00 in 10 days or return the book.

Name .....
Home Address .....
City and State .....
Position .....
Name of Company *QST-6-31*

Calls Heard

431 E. Willow Grove Ave., Chestnut Hill, Pa.
Editor, *QST:*

Some months ago *QST* informed its readers that it would cease to publish "Calls Heard." Subsequently, a strenuous objection obliged the reinstatement of this department.

Quite obviously it would be impossible for *QST* to publish *all* the "Calls Heard" reports and have any room left for the rest of the magazine. Also, those lists that are published, especially from foreign sources, must of necessity be antiquated to the extent of possibly four or five months so that when a station is reported from some distant corner of the globe through this medium the operator would more than likely have changed adjustments — not to say bands — and the report would be of little value other than to pride. Reports of signals alone, without actual contact, do not help the WAC business.

It seems to me — and I like my DX as much as anybody — that the pages of *QST* are much too valuable to give space in them to a subject that can be of so little value. Would not the pages so used be just the place for those technical articles that a number of the gang have been requesting? What are the arguments?

— *John B. Morgan 2nd, W3QP*

Random Thoughts from the Orient

Tebing Tinggi, Sumatra, D. E. I.
Editor, *QST:*

I haven't missed a copy of *QST* for eight years. Have just received the January issue and wish to state that I still derive the same big kick as upon receiving the first few issues. At present I am detained at the hospital with one of the tropical maladies and the ole *QST* has done me more good than all the pills and hypodermics.

As I now have time to think of ham radio in the past I am pleased to note many pleasant changes, such as the splendid coöperation between the code man and the 'phone man. In the old days the code man regarded the 'phone man as just a little better than a BCL. One need not investigate far now to see that this is no longer true. No necessity for different clubs any more.

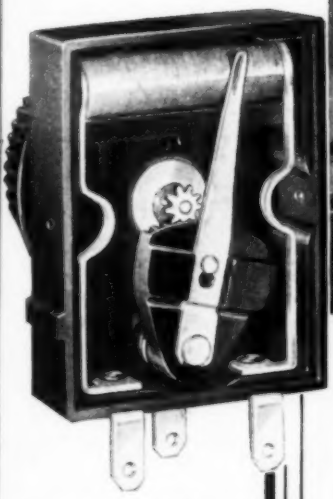
The editorial as of January, stating an increase of 2165 amateurs in the states alone, is very gratifying. I believe we could wisely choose the slogan "In Increased Numbers We Survive."

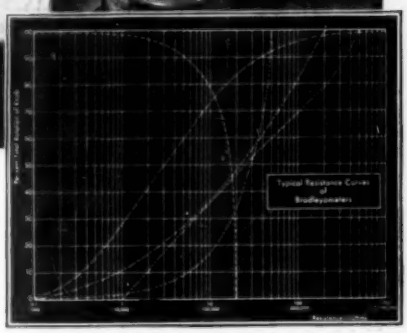
Among the greatest pleasures I have experienced in ham radio is that of helping new men get started. I have always found them appreciative and they remain the strongest of friends.

QST should be praised for the *Handbook*, beginners' code practice, and the little booklet "How to Become a Radio Amateur." Never has there been so much information available for the beginner.

Am anticipating QSO's with the W gang before my return.

— *Wayland M. Groves, W5NW*





Other Allen-Bradley Radio Products

Bradleyunits are solid molded resistors, made in five sizes with or without tinned leads. They are color coded to meet any manufacturer's specifications.

Bradley Suppressors for radio equipped cars are used by leading car manufacturers and make shielded ignition cables unnecessary for good reception.

The Bradleyometer

Assembled by automatic machinery to produce any performance curve!

Manufacturing facilities in the Allen-Bradley plant keep pace with the rapidly increasing demand for the new Bradleyometer.

The Bradleyometer is a "stepped" potentiometer of about fifty steps and comprises a series of resistance disks. The resistance value of each step is separately controlled and the total number of disks are assembled by automatic machinery to conform with the Resistance-Rotation curve as specified by any manufacturer.

Bradleyometers are used extensively for volume controls, tone controls, mixer controls, attenuators, and in connection with telephone equipment, public address systems, radio receivers, phonographs, etc. Write for technical data today.

Allen-Bradley Co.

108 W. Greenfield Ave. Milwaukee, Wisconsin

Type A, Single Bradleyometer

Type AA, Double Bradleyometer

Type AAA Triple Bradleyometer

ALLEN-BRADLEY RESISTORS

Produced by the makers of Allen-Bradley Control Apparatus

RCA TUBES • UX280 • 82c

UX281.....	$2.95	UY227.....	75c
UX210.....	4.20	UX250.....	$3.60
UY224.....	1.20	UX245.....	84c

At these new sensationally low prices on brand new RCA tubes — you can afford to buy the best. Guaranteed both by us and the Radio Corporation of America.

COLUMBIA POWER TRANSFORMERS

Type	*Wattage*	*Output voltage*	*Filament voltages*	*Price*
A	200	600–0–600	7½ ct and 7½ ct	$3.75
B	250	750–0–750		4.95
C	350	1000–0–1000		6.25
D	500	1500–0–1500		9.50
E	750	2000–0–2000		13.00
F	250	750–0–750	7½ ct and 7½ ct	5.75

FILAMENT TRANSFORMERS. An efficient sturdily constructed job. All secondaries centertapped. Mounted. Deduct 10% from these prices if no centertap is wanted.

Voltages	*12 Watts*	*25 Watts*	*50 Watts*
2½	$1.25	$1.95	$2.50
2½ and 2½	1.50	2.25	2.75
7½	1.25	1.95	3.25
7½ and 7½	....	2.25	3.95
10	....	....	3.40

MICROPHONE TRANSFORMER: For double-button microphones. May also be used for single button microphones. Excellent quality. Special..... $1.40

RCA VICTOR Power transformers. 150 Watts. Just the job for that 245 push-pull transmitter. Supplies — 750 Volts centertapped, 2½ ct, 5 ct, and 2½, 1½, and 1½ Volts.... $2.25

COLUMBIA TRANSMITTING FILTER CONDENSERS: NEW — 1500-Volt and 2000-Volt sizes are now manufactured with large stand-off insulators. Other sizes use slightly smaller standoffs. Sold with an absolute replacement guarantee. Note the low prices.

WORKING VOLTAGES

Capacity	*700 DC*	*1000 DC*	*1500 DC*	*2000 DC*
1 mfd	$1.10	$1.50	$2.40	$3.90
2 mfd	1.75	2.40	3.85	6.40
4 mfd	2.95	3.90	6.85	10.80

GENERAL ELECTRIC: 30 Henry, 150 Mill chokes. Very neat, black finish..... $1.50
WESTERN ELECTRIC: 1000 Volt 1 mfd condensers... 75c
GRID LEAKS: Hardwick Hindle, wire wound — for all tubes up to 250 watts. 10,000 Ohms, 1" x 6" — 95c; 5000 Ohm — 65c. Kroblack 50 Watt, 50,000 Ohm — 75c.
COLUMBIA: 30 Henry, 200 Mill chokes. Very rugged. Specially priced..... $2.50
COLUMBIA: 30 Henry, 120 Mill chokes. Mounted.... $1.30

Our new catalog of bargains is Free. Send for it.
Immediate Service — **Terms: Cash or C.O.D.**

COLUMBIA SPECIALTY CO.
925 Westchester Avenue — New York City
Please note our new address!

FIRST QUALITY QUARTZ CRYSTALS

Scientifically Prepared for Maximum Power and Unconditionally Guaranteed 1 in. square sections, (*close to your specified frequency*), supplied *promptly* at the following prices:

40-75 meters	$17.50
75-100 meters	12.50
100-200 meters	9.00
200-600 meters	15.00
1 in. Tested blanks, 200-400, 400-600 meters	3.50
Dustproof Bakelite mounts	3.00

(*A Calibration furnished with each crystal*)
Sections of any practicable dimensions made to order
(*Charges for grinding to exact frequencies given on request*)

J. T. Rooney, B. Sc., 4 Calumet Bldg., Buffalo, New York
"*A pioneer crystal grinder*"

SEE PAGE 85

for information you have long wanted to complete your back copy files.

Many of these copies will not be available six months from now.

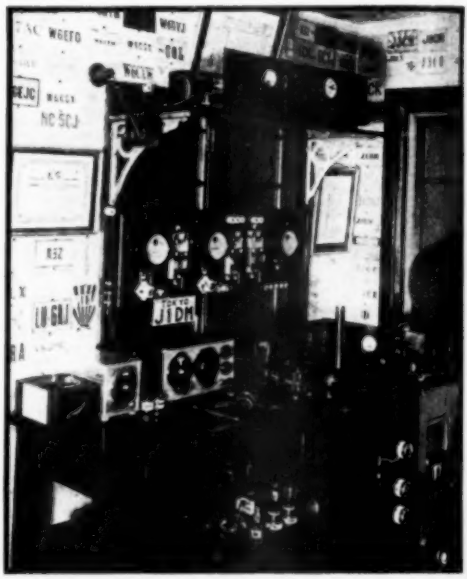
Act promptly!

I.A.R.U. News

(*Continued from page 59*)

The QSL address for Switzerland is: Swiss QSL-Service, Postfach, Berne 14, Switzerland.

Last summer we learned that joyful news had reached the ears of Czechoslovakian amateurs. The Ministry of Posts and Telegraphs had lifted the ban on amateur radio stations and begun to grant permits for their operation. Then we learned that four, then seven, finally thirteen stations had been licensed. Now comes



J1DM, OWNED BY SEIICHIRO HANDA, 56 KITAMISUJI, ASAKUSA, TOKYO, JAPAN

Under cover since 1928, this station has been licensed since last October for both c.w. and 'phone. Power is 20 watts to one UX-210 in t.g.t.p. A Type '50 tube and Heising modulation provide telephony.

All continents have been worked by the 17-year old operator, who is one of the youngest amateurs in Japan, and a committee-man of the J.A.R.L. He is commendably endeavoring to promote better diplomatic relations between Japan and other countries, and his principal wish is that message-handling were permitted to Japanese amateurs.

a statement by Assistant Trade Commissioner Sam E. Woods, Prague, Czechoslovakia, that "not much interest has been manifested, however, and to date only 14 permits have been issued." What can we make of that? Have we only a few amateurs among our Czech friends, or would they just as soon work without licenses?

Belgian Report

By Paul de Neck, *Pres. Reseau Belge*

The beginning of the year was very bad indeed with regard to wave propagation on all bands. Except for a few short intervals during which a very few of the more powerful North American stations could be worked, all of the traffic was reduced to inter-European contacts on the 7-mc. band.

ALUMINUM PANELS
Cut to size

1/16" thick . . . . . 7/10c sq. in.
3/32" thick . . . . . ¾c sq. in.
1/8" thick . . . . . 1c sq. in.
3/16" thick . . . . . 1½c sq. in.

SPECIAL SHIELD CAN
5" x 6" x 9", special $1.85
7" x 8" x 14", special 3.95
Write for special prices on many other sizes

NEW — Filament Transformer. Has 3 separate 7½-v. C.T. windings for crystal control transmitters, etc. Extra special price $8.50

Special 866 Filament Transformer 2½ volts, 10 amps, 10,000 volt insulation. Extra special price $4.35

Special Filament Transformer, 10 volts, center tapped, 7½ amperes. Extra special price $5.65

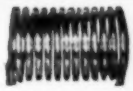
MESCO KEYS
Grand cleanup on these high grade keys; while they last. No. 101 — No. 103 either type, each . . . **95c**

LEEDS
The Home of RADIO
45 VESEY STREET
NEW YORK
New York's Headquarters for Transmitting Apparatus
When in Town Visit Our Store

EVERYTHING IN
ACME JEWELL PYREX
BRADLEY FLERON
THORDARSON
ELECTRAD NATIONAL
LYNCH SIGNAL
FLECHTHEIM
NATIONAL RECTOBULB
GENERAL RADIO
CARDWELL AEROVOX
WESTON
SIEMENS CONDENSERS
IN STOCK

SPECIAL FILAMENT TRANSFORMER 1-7½ volt center tapped at 7 amps. Extra special price. **$4.35**

Sangamo Type A.X. Audio Transformers, 3:1 ratio. List price $6.00. Extra special price. . . . **$1.50**



COPPER COIL
Make your own transmitting coils. Copper tubing transmitting inductance.

Size of tubing

Inside Dia.	3/16"	1/4"	5/16"
2 1/8"	9c	10c	12c
2 3/8"	9c	10c	15c
3 1/8"	10c	12c	17c
1 5/8"	9c	10c	

Prices per turn

GENERAL RADIO AUDIO TRANSFORMERS
Type 285 H — 6-1 Ratio
Type 285 D — 2.7-1 Ratio
The above are among the best known audio transformers on the market to-day. At our special price they are a real buy. Only **$1.39**
DEALERS — *Write for our special offer in 100 lots*

Sangamo G.X. 210 or H.X. 171 Push Pull Transformer. List price $13.00 pair. Extra special price, per pair, **$3.00**

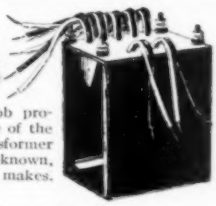
LEEDS RADIO LABORATORIES
Precision Custom Built Short Wave Receivers and Transmitters
This department under the supervision of the Short-Wave Specialist Jerome Gross. We design, construct and advise on any material for the "Ham" Broadcasting station or laboratory. Write Jerry Gross for advice on any of your problems.
Announcing a new line of crystal control 2 and 3 tube low power transmitters and kits and Quartz Crystals. Write for particulars.

LEEDS 866 Type 2½ volt Filament Mercury Rectifiers
Many new features such as wire mesh filament, etc. Every tube rectifier tested before shipment insuring satisfaction. Special, each **$6.00**

AIR GAP SOCKET
The socket recommended by *QST*. Due to the great demand for this socket, we have finally procured a quantity of them. Ideal for all short wave work. Stock up on these sockets while they last. Illustrated in May issue. Special price, each **35c**

LEEDS Type C–2 Crystal Control Transmitter
LEEDS C-2 transmitter kit is supplied completely assembled, but not wired. (We can supply these sets wired and tested to order). Completely shielded in a nicely finished aluminum case. 3 Weston milliammeters and 1 antenna meter are supplied. Uses one 210 as crystal oscillator, one 210 as buffer or doubler and one 210 as neutralized amplifier. This set can be used very effectively to drive a larger tube later on, for increased power. We can also supply a similar transmitter to the above for a 50-watt tube in the output stage.
Write for prices, etc.
See April *QST* for 2-tube Crystal Set

FERRANTI
Power Transformers
EXTRA SPECIAL OFFER $7.95
List price $40 each . . . . . .



This transformer is a quality job produced by a company making some of the finest radio equipment. The transformer should not be confused with unknown, overrated transformers of inferior makes.

Specifications:
Primary 110 or 220 volts a.c. 60 cycles
1–1300 volt center tapped 200 M.A., 650 volts each side
1–7.5 volts c.t. — 3½ amps 1–2.5 volts c.t. — 4 amps
1–7.5 volts c.t. — 3½ amps 1–1.5 volts c.t. — 2.5 amps
Total wattage 325 watts
Weight — 18½ lbs. Size 5" x 6" x 6½" overall

Complete line of Leach Relays in stock

SPECIAL for this Month ONLY on NATIONAL Short Wave Receivers
D.S.S.W. 5 for use with the new 2 volt tubes; all wired. List price $85. Extra special price **$48.40**
A.C.S.W. 5 — National A.C. set, all wired. List $89.50. Extra special price **$51.00**

PLEASE PRINT YOUR NAME AND ADDRESS PLAINLY TO AVOID DELAY | **WRITE FOR SPECIAL PRICE LIST** | **MAIL ORDERS FILLED SAME DAY**
10% Cash Must Accompany All C. O. D. Orders

BUY FROM THE OLDEST AND MOST CONSISTENT HAM SUPPLY HOUSE

STROMBERG-CARLSON 250 Watt Power Transformer, gives 1200 volts c.t., 7.5 for 2–281's, 7.5 for 2–250's, 150 volts c.t. and 4 volts. Cat. No. 1011. $ 4.75
THORDARSON new T-3202A 250 Watt Power Transformer, gives 1300 volts c.t., 7.5 volts in two c.t. windings, 2.5 volts at 14 amps. Cat. No. 1001. $ 5.75
THORDARSON T-3321 175 Watt Power Transformer, gives 1150 volts c.t., 7.5 volts in two c.t. windings and 3 volts. Cat. No. 1002. $ 3.25
Same transformer for 25 cycle use. Cat. No. 1043. $ 5.75
THORDARSON Sonora Power Transformer, T-3952, 100 Watts, gives 700 volts c.t., 5 volts for 280 and 2.5 volts for 7 tubes. Cat. No. 1005. $ 2.25
Same transformer for 25 cycle use. Cat. No. 1048. $ 2.75
THORDARSON T-2430A 150 Watt Power Transformer, gives 800 volts c.t. at 350 mils and 5 volts at 4 amps. Cat. No. 1006. $ 2.75
THORDARSON T-3487 100 Watt Power Transformer, gives 600 volts c.t., 5 volts c.t. at 1 amp., 5 volts, c.t. at 2 amps. and 3 volts c.t. at 8 amps. Cat. No. 1046. $ 2.50
Same transformer for 25 cycle use. Cat. No. 1047. $ 3.50
THORDARSON Double Filter Chokes, two windings, each 18 henrys, 250 mils. Cat. No. 1751. $ 4.75
THORDARSON Double Filter Chokes, two windings, each 30 henrys, 100 mils. Cat. No. 1768. $ 1.95
THORDARSON Single Filter Chokes, 25 henrys, 150 mils. Cat. No. 1767. $ 2.75
R.C.A. Double Filter Chokes, two windings, each 30 henrys, 100 mils. Cat. No. 1760. $ .75
CHICAGO TRANSFORMER CO. Filter Choke, 30 henrys, 120 mils. Cat. No. 1753. $ 1.25

R.C.A. UNI-RECTRON Power Supply and 210 Amplifier. Delivers 400 volts of D.C. filtered current. Ideal for low power transmitter. If desired 210 can be used as modulator. Less tubes. Cat. No. 7252. $7.50

AMERICAN Filament Transformers, 2.5 volts c.t. in two windings at 11 and 3 amps., 5 volts at 3 amps. c.t. Cat. No. 1252. $ 3.25
AMERICAN Filament Transformers, 1.5 volts at 7 amps., 2.5 volts at 3½ amps., two windings of 5 volts at 2 amps., each — all center-tapped. Cat. No. 1253. $ 2.75
THORDARSON Cased Audio Transformers, 2–1 and 3–1 ratios. Cat. Nos. 1542-3. $ .95
SIGNAL CORP. "Speed Bug" Keys. Cat. No. 8034. $10.25
AMERICAN 50 Watt Sockets. Cat. No. 8022. $ 2.25
AMERICAN Double Button Mikes, 200 ohms, will take up to 40 mils per button. Cat. No. 7001. $19.50
R.C.A. Power Rheostat, PR-537, 15 amps. For large transmitting tubes. Cat. No. 4253. $ 2.75
QUARTZ Guaranteed Oscillating Crystals, 3500 to 4000 K.C. Cat. No. 8016. $ 5.25
T.G.T.P. 30 Watt Transmitter with large power pack, completely wired, with Jewell Meter. Uses 2–281 and 1–210 tubes. *QST* specifications. Cat. No. 8032. $48.75
BRANDES Superior 2000 ohm headphones, ideal for s.w. Cat. No. 9022. $ 1.45
BBL Giant Magnetic Unit. Cat. No. 3276. $ 1.75
NEON ½ Watt Bulb. Cat. No. 5060. $ .65
DEFOREST 552, 75 Watt Tube. Cat. No. 5039. $24.25
DEFOREST 566 Mercury Vapor Tube. Cat. No. 5047. $ 9.00

KOLSTER K-5 Dynamic Speaker with 210 power amplifier and "B" supply unit, in console walnut cabinet; uses 2–281's, 1–210 and 1–874 Voltage Regulator Tube. Less tubes. Cat. No. 7525. $11.00

SOVEREIGN C401, 3 volt tube for Sparton, Cleartone, Day-Fan Receivers, etc. Cat. No. 5077. $ 1.50
DUBILIER 11¼ mfd. Filter Block, 3 mfd. at 1000, 4 at 600 and 4½ at 160 volts. Cat. No. 2001. $ 2.50
DUBILIER PL 571; 4 mfd. at 600 D.C. Wkg. Voltage. Cat. No. 2006. $ 1.25
AEROVOX 7 mfd. Filter Block, 2 mfd. at 1000, 2 at 800 and 3 at 400 volts. Cat. No. 2002. $ 2.00
WESTINGHOUSE 1 mfd. 2000 volt Filter Condenser (4000 volt test). Cat. No. 2061. $ 3.25
BROWN & CAINE 8 mfd. Filter Condenser Block, 800 volts, tapped at 1, 1, 1 and 5 mfd. Cat. No. 2069. $ 3.50
Same condenser for 25 cycle use. Cat. No. 2070. $ 4.25
BROWN & CAINE 8½ mfd. Filter Condenser Block, 800 volts, tapped at 1, 1, 2, 2, 2, and ½ mfd. Cat. No. 2067. $ 3.50
Same condenser for 25 cycle use Cat. No. 2068. $ 4.25
FLECHTHEIM Transmitting Filter Condensers.

Cat. No. 8001	D.C. Wkg. Voltage			
Capacity	1500	2000	3000	7000
1 mfd.	$2.70	$4.00	$12.00	$50.00
2 mfd.	5.10	9.00	19.50	95.00
4 mfd.	8.70	15.60	36.00	175.00

Please Use Catalogue Numbers When Ordering

Send For Our Complete Catalogue on Ham Equipment

AMERICAN SALES COMPANY
Q-44 W. 18th St. New York City

At the end of February and during March, the 14-mc. band grew slowly better, and good contacts were had with the antipodes. ZL, VK, TI, CM, PY and also the extremity of Asia came in with normal strength all through the day, but were especially good during the early mornings and afternoons (G.C.T.). The Belgian hams did a lot of good work then, and new WAC Club members were made.

The 8th Annual Meeting of the Reseau Belge was held at Brussels on the first Sunday in February. About 70 members were present. Mr. Kersse, ON4GW of Antwerp, was elected vice-president, and gave a lecture on the decision taken by the Council to change the form of our Society into an official association.

Among the other decisions taken was that which provided for the introduction of the "QSL stamps" idea into our forwarding service. Another provided for placing the membership fee for foreign members at Belgas: 10 (about $1.40.— *C. B. D.*).

A very pleasant hamfest with intervals of movies took place after the meeting and a cordial vote of thanks was given the Council for their good work.

The Council decided to start a special R.B. laboratory, with a crystal control transmitter which will be capable of sending calibrated waves. A very well-built frequency meter is already in service in the hands of its builder, our Technical Director, Mr. Cosyns, ex-B9. It is accurate to within one part in 20,000 and is controlled in part by a special crystal at about 3500 kc. supplemented by a Siemens clock (50 periods). The counter clock is put in rotation by selected harmonics of the crystal.

Special recommendations have been given members to construct their own frequency meters, and accepted apparatus is calibrated in our laboratories to an accuracy of one part in 200 for the nominal sum of Belgas: 6.

A special Committee has been formed by the Minister of Telegraphs to study the question of the struggle against industrial QRM. Our President, ON4UU, has been chosen as one of the members.

New or modified legislation is now in preparation at the P.T.T. The new regulations will include opening of the 3.5-mc. band, Morse certificates obligatory, also possession of a reliable frequency meter. Finally (and alas!) maximum power input to the final stage will be reduced to 50 watts (of course, this doesn't mean a great deal. Hi!).

British Report

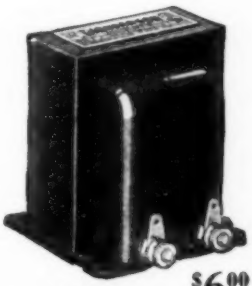
By J. Clarricoats, *Hon. Sec. R.S.G.B.*

British Empire Radio Week reports began to arrive during March from nearby stations, but it is too early yet to even hazard a guess as to the winner of the B.E.R.U. Trophy. Fred Miles, G5ML, leads for Great Britain; Earle Turner, VE2CA, for Canada; H. Morstadt, SU1AQ, for Egypt; N. H. Auret, ZU6W, for South Africa;

MAXIMUM POWER TRANSFER

With Unusual Fidelity at All Audio Frequencies in the New

THORDARSON PENTODE OUTPUT TRANSFORMER



T-4843 $6.00

The Thordarson T-4843 output transformer is designed to couple the new power output pentode tube to the voice coil of a dynamic speaker. The turn ratio of the transformer is 30 to 1 and the impedance ratio is 932 to 1. It is designed so that the reflected load on the pentode is 8000 ohms when connected with a speaker whose voice coil has an impedance of 8.6 ohms. The size is 2½ x 2½ x 3 inches high. Weight — 2 pounds. *For sale at all good Parts Dealers.*

THORDARSON

Transformer Specialists Since 1895

THORDARSON ELECTRIC MANUFACTURING COMPANY 500 West Huron Street CHICAGO, ILL., U.S.A.

FROST-RADIO

No. 20 Series Single Control

No. 20 Series Single Control with A.C. Switch

Why is this new unit completely noiseless?

First, because of the design of the variable contactor used in the new FROST-RADIO No. 20 Series Volume Controls, which makes two separate and distinct *line* contacts, totaling 3/16", with the resistance element. Second, because space between turns has been successfully reduced to one ten-thousandth of an inch, permitting the use of *more* turns and *larger* wire. And third, because contact pressure has been greatly reduced, eliminating cutting and scoring. . . The No. 20 Series possesses many other advantages. Write us for further details NOW.

CHICAGO TELEPHONE SUPPLY CO.
HERBERT H. FROST, Inc.
Sales Division
General Offices and Plant: ELKHART, INDIANA

FLERON RADIO AERIAL ACCESSORIES

The Complete Line From One Source
M. M. FLERON & SON, Inc.
TRENTON, NEW JERSEY

Cunningham
RADIO TUBES

RADIO'S MOTIVE POWER
SINCE 1915

CX-331
Low Filament Current
and
Voltage Power
Amplifier

Operating Voltages:

Ef	2.0 volts
Eb (max.)	135 volts
Ec	— 22.5 volts

A power amplifier suited for battery operated receivers. The operating filament voltage range is such that a two volt storage battery can be used to operate the filament of CX-331 without a filament rheostat or resistor. In portable sets when dry cells are used, a filament voltmeter with an adjustable rheostat is recommended to maintain proper filament voltage.

The power output of the CX-331 is 150 milliwatts which is usually sufficient for loudspeaker operation in portable sets; and where additional volume is required, two of these tubes may be used in pushpull. When used with CX-330 and CX-332 a high quality battery operated receiver with low A battery drain is possible.

E. T. CUNNINGHAM, INC.

A subsidiary of Radio Corporation of America

New York · Chicago · San Francisco
Dallas · Atlanta

and A. M. Rahim, VS7AP, for India and Ceylon. But we believe our Australian and New Zealand colleagues have beaten the totals made by all others.

The Trophy, if it is won by an overseas station as seems likely, will be forwarded to the Headquarters Executive of the National Society to which the winner belongs, and they will be asked to arrange for the presentation. It is felt that the awarding of such a coveted trophy should be carried out if possible in the presence of a representative gathering of overseas amateurs.

During March considerable activity on 14-mc. was noted. Our American friends seem to have been very fortunate in selecting two of the best weeks for their International Tests.

The British 28- and 56-mc. tests proved unsuccessful, due in the former case to poor conditions, but it is pleasing to record that in spite of negative results, the interest in ultra high frequency work continues. On March 25th the London members were given the opportunity of listening to a lecture by Mr. Eric Megaw, G6MU, on the subject of "Ultra High Frequency Oscillations." Following the lecture Mr. Megaw demonstrated the transmission and reception of 44-cm. signals. Interested amateurs will find a copy of the lecture in the May issue of the *T. & R. Bulletin.*

Dutch Report

Received by amateur radio from the* N.V.I.R. HQ. *and* Traffic Manager *through PA0QQ and W2CGV

On April 6th the N.V.I.R. presided over by its president, J. Corvier, held its annual meeting in Amsterdam. Following the official statements on club activities and section reports, there were two principal questions to consider. The first of these was concerned with the attitude of the N.V.I.R. in future toward unlicensed members. After some discussion the members adopted a resolution giving HQ. full mandate to give all information concerning unlicensed stations to any official asking for it. Beginning with July 1st, in addition, the QSL Service will cease to function for these stations.

The second important question was that of a possible fusion of the N.V.I.R. with the N.V.V.R., the oldest Dutch radio society, which has chiefly BCL interests in view. After a long discussion of the proposal of the N.V.V.R., which provided for amalgamation giving us only the right of having our own directors to settle our internal affairs, the members decided not to give up our name and existence as a society having the royal consent. A further consideration was our desire not to abandon relations with the I.A.R.U. as the Dutch Section. Fusion of the two societies thus being inadvisable, headquarters were authorized to negotiate with the N.V.V.R. concerning a federation of Dutch radio societies to prevent competition and to combine administrations.

A motion was made and accepted instructing headquarters to attempt to get the 1750 kc. band open for Dutch amateur use. After election of the

Every Amateur Uses These Forms

MEMBER'S CORRESPONDENCE STATIONERY

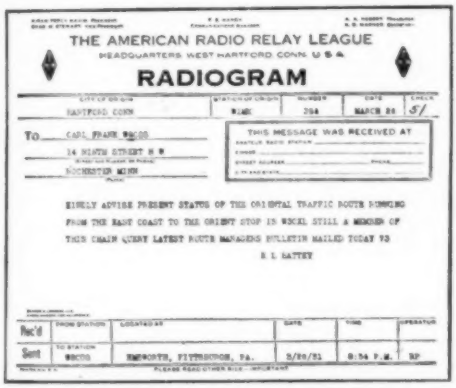
One color (black) heading now being used at greatly reduced cost to members.

Write your radio letters on League stationery — it identifies you.

Lithographed on 8½ x 11 heavy bond paper.

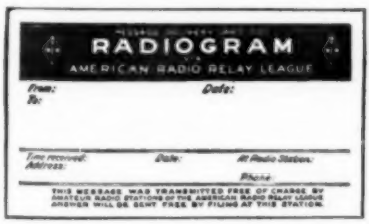
100 sheets **50c**
250 sheets **$1.00**
500 sheets **$1.75**

Postage Included



OFFICIAL A.R.R.L. MESSAGE BLANKS

Most convenient form. Designed by the Communications Department of the A.R.R.L. Well printed on good bond paper. Size 8½ x 7¼. Put up in pads of 100 sheets. One pad postpaid for 35c or three pads for $1.00.



MESSAGE DELIVERY CARDS

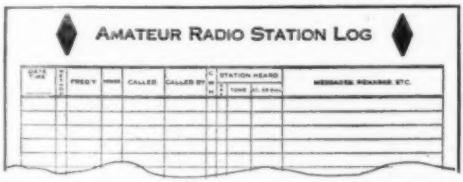
Neatest, simplest way to deliver a message to a near-by town. On U. S. stamped postals 2c each. On plain cards (for Canada, etc.) 1c each, postpaid.

Everything that you've wanted in a log is in the Official A. R. R. L. Log Book

New page design to take care of every operating need and fulfil the requirements of the new regulations!

New book form! No more fussing with binders, or trying to weight down loose sheets when the breezes blow!

New handy operating hints and log-keeping suggestions, put where they are always convenient!



THERE are 39 pages like the one above, 8¼" x 10¾", carefully designed to incorporate space for all the essential information you want and need to record about your station's operation. Thirty-nine blank pages (backs of the log pages) to be used for notes, experiments, changes of equipment, etc. Durable covers of heavy stock with space for your station call and dates over which the log entries extend. On the inside covers and first two pages are complete instructions on maintaining your log, convenient tabulations of the most-used Q signals, miscellaneous abbreviations, operating hints, amateur prefixes and signal-strength scales. The information you want, always at your finger-tips.

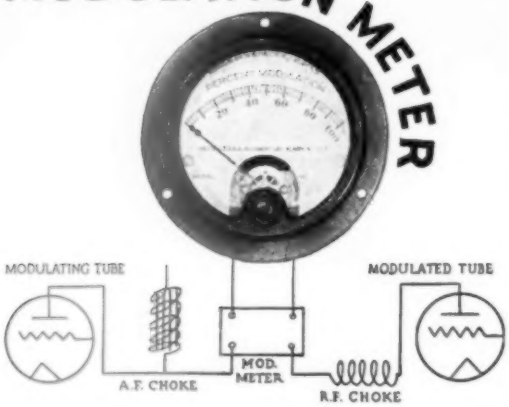
The new regulations require a log; a well-kept one identifies your station; a uniform series constitutes a progressive and permanent record.

We honestly believe the new Official A.R.R.L. Log Book is the best you've ever seen!

40 cents each
Three for $1.00
Postpaid anywhere

AMERICAN RADIO RELAY LEAGUE + WEST HARTFORD, CONN., U. S. A.

MODULATION METER



for direct reading in percent of full MODULATION

● This new Modulation Meter, Weston Model 588, involving an improved advanced construction, gives a continuous indication of the percentage of modulation. This is extremely valuable to broadcasting stations and amateurs in transmission of speech and music, as it furnishes a simple means to indicate continuously the effectiveness of station output.

Model 588 is an instrument of the rectifier type. Its scale is calibrated in percent of full modulation of the transmitter. It consists of a meter and an external box with four binding posts. Two of these binding posts are connected in the plate circuit of the modulated tube and the other two to the instrument which may be placed at any convenient location. The circuit of the external box is so arranged that no direct current passes through the meter.

When ordering, specify the amplitude of the carrier wave or, if this is not known and cannot be measured, specify the known D.C. plate current of the modulated tube in your transmitter. This value is necessary to accurately adjust the instrument to your operating condition.

WESTON ELECTRICAL INSTRUMENT CORPORATION

602 Frelinghuysen Avenue Newark, N. J.

WESTON ELECTRICAL INST. CORP.
602 Frelinghuysen Avenue
Newark, N. J.

Please send me further details regarding the new Weston Modulation Meter, Model 588.

Name.....*Station*.....

Street.....

City.....*State*.....

committee, this part of the meeting was followed by a FB hamfest which made a glorious close to the day.

During the past month an increasing amount of activity on all bands was noted by Dutch amateurs, the only exception being 28-mc. on which conditions were bad enough to discourage all PA's. No work or results were therefore reported in this region.

On the 14-mc. band conditions are getting better and better, especially for W, VE, and PY QSO's. Some days it has been possible to work W's from 1200 to 2300 G.C.T. A number of Dutch stations participated in the A.R.R.L. International Contest. Conditions for Asia and Oceania QSO's were rather changeable.

On the 7-mc. band due to QRM from rotten European phone, a.c. and r.a.c. signals, it was difficult most of the time to work any DX except for occasional nights and silent mornings when some PA's managed to work VK, ZL and the U.S.A.

3.5-mc. was often crowded with phone stations, although there was another kind of activity, too. The Central Section held its PA QSO contest, which was quite a success. There were plenty of W's heard during this month, but only two W-PA QSO's on 3.5-mc. were reported.

Finnish Notes

Prepared by the S.R.A.L.

Conditions for March were on the whole exceedingly good on the 7- and 14-mc. bands, and the QSO-Contest arranged by the A.R.R.L. hit the right time. Only a few of the Finnish amateurs took part, but these enjoyed good results. The U. S. A. was heard regularly with good strength early in the afternoons, and the audibility persisted on many a night until midnight. Later in the night one had to change to the 7-mc. band. South American amateurs have also been heard for a long time.

Noteworthy is a contact with KA1ZA in Manila, whose station a Finnish journalist just visited. Through amateur radio he got in touch with his native country and his family via OH1NI, OH3NA and OH5NG. The journalist above-mentioned has sent a letter about these communications and an account of KA1ZA to the weekly newspaper most widely circulated in our country, which incident signifies some good publicity for the Finnish amateurs.

Signals from KA and OM (OM1TB and OM2CS) on the 7- and 14-mc. bands were very strong, but on the 7-mc. band particularly establishing communication with the Far East normally offers difficulties. Nevertheless, OH2PN has succeeded in contacting Japan on 7-mc. using a small receiving tube with 5 watts input in his transmitter.

Special attention is now being paid to the 3.5-mc. band in order to place it in general use, and the intention is to start regular national work in this band during the coming months.

The revised and enlarged
edition of CIRCULAR 507 describing
RESISTORS and RHEOSTATS
for RADIO
is now ready

Write for your copy to-day

WARD LEONARD ELECTRIC CO.

MOUNT VERNON, NEW YORK

HEADQUARTERS
for the "HAM"

The Following Items are Standard High Quality Merchandise and are listed only during the month of June at these special prices. Each article is GUARANTEED and BACKED BY OUR THIRTY YEARS Reputation of FAIR DEALING.

866 Mercury Vapor Rectifier Tubes (Standard Makes) $4.50

200 Watt 50,000 OHM Bleeder Resistor with Mid Tap $3.45

Single or Double Button Microphone Transformer (Made by prominent manufacturer) $3.00

$23 High quality Double-button Microphone, Low-carbon Hiss Flat Response, 70 to 7,000 cycles, special this month $11.98

'Phone men will find it to their advantage to communicate their needs to us. We solicit your inquiries.

M & H SPORTING GOODS CO.

512 Market Street, Phila., Pa.

STAR
MICROPHONE
Double Button

Model C

See Page 81 This Issue

List Price $35.00

Special to Amateurs Only $19.50

Gavitt Mfg. Co., Inc.

Brookfield, Mass.

YOU CAN BUY

any of the items offered here or in our catalog with the assuarnce that it will be exactly as described and suitable for "Ham" use. If you are not completely satisfied you may return the merchandise within five days and have your money returned. Can anything be fairer? And if you are not already one of our many satisfied customers, send us a trial order and see what *real* service is. 73 **W. E. Harrison (W2AVA), *Mgr.***

And here's where you save money!

ROYAL HEAVY DUTY TRANSFORMERS

Powerful and sturdy! Carefully constructed of the best materials Guaranteed for one year against any defect. Mounted.
2000 and 1500 each side of center-tap. 800 Watts. 28½ lbs. **$13.25**
1500 and 1000 each side of center-tap. 375 Watts. 19 lbs.... **$9.65**
1500 CT., 7½ CT., 7½ and 2½ CT. 275 W. 14 lbs..... **$6.45**
1200 CT., 7½ CT., 7½ and 2½ CT. 200 W. 11 lbs..... **$5.85**
Filament: Completely shielded in metal containers.
2½V-12A — **$2.25**; CT., **$2.75**. 7½V-6A — **$2.75**; CT., **$3.20**. 10V-8A — **$2.95**; CT., **$3.40**. 2½V-4A & 2½V-12A — **$2.75**; CT., **$3.20**. 2½V-10A and 10V-3A — **$4.50**; CT., **$5.25**. 7½ V-3A and 7½ V-6A — **$4.15**; CT., **$4.95**.
7½ Volt, 3 Amp. (CT) and 7½ Volt, 3 Amp. (Not CT).. **$3.65**
ROYAL 30 Henry, 300 Milliampere Extra Heavy Chokes. 80 Ohms. 18 lbs. — **$8.65**. 15 H. 300 MA. 75 Ohms. 7½ lbs. **$4.15**
ACME Chokes. New Open frame mounting. Very neat. 30 Henry, 200 MA. — **$3.95** 20 Henry, 300 MA. — **$3.75**
SPECIAL 30 H., 200 MA. Chokes. Very rugged..... **$2.45**
Double: Each section 30 H., 200 MA..... **$4.65**
RCA SINGLE. 30 H., 150 MA. 200 ohms. Open frame..... 95c
RCA DOUBLE. Each section 30 H., 125 MA. Metal-cased. **$1.85**
G.E. 5 H., 1000 MA. 25 Ohms. Metal cased. 11 lbs..... **$2.65**
Mounted RF Chokes. 85 Millihenry..... 35c

JUNE SUPER-SPECIALS

Only one to a customer — *Good this month only*
FEDERAL or ERLA 3½: 1 Audio Transformers..... 85c
TOBE 10¼ mfd., 600 volt Block. Metal case (no cover).. 45c
Live Rubber shock absorbing UX sockets. Three for... 10c

OTHER POWER TRANSFORMERS

ZENITH. Gives 7½ Volt CT. and 750 Volts for half-wave rectifier. FB for 210 transmitters. 200 Watt. 8½ lbs..... **$2.35**
HEAVY DUTY. Gives 750 CT., 5, 2½, 2½, and 1½ Volts. A husky job for 245 P-P transmitter or AC set. Shielded... **$3.50**
FRESHMAN. 125 Watt. 7½ CT., 7½ CT., and 375 Volts. Also gives grid bias for 210. Very sturdy. Metal-cased. 7 lbs... **$1.65**
FILAMENT. 7½ Volt, 6 Amp. Unmounted..... **$1.35**
RCA VICTOR. 150 Watt. Supplies 650 volts center-tapped 2½ CT, 2½, 1½, 1½, and 5 CT. Our Price..... **$2.15**
ZENITH ZE-7 Power Supply. Delivers 800 Volts of rectified AC all ready for filtering and filament for 210, 272's and 226's. In metal cabinet. Build your AC set or amplifier around this superior unit! Original cartons. Uses 281 tube. Only.... **$9.25**

PUSH-PULL POWER AMPLIFIER KITS

Complete parts for a QUALITY Amplifier including power supply. First stage 227. Will also supply A B and C to receiver. For UX-245's — **$10.75**. For UX-250's — **$14.75**.
Complete high-grade parts for 245 P-P Transmitter (à la Nov. QST) — **$16.95**. Power Supply alone..... **$8.95**

ROYAL PORCELAIN STAND-OFF INSULATORS

Neatest and best-designed. Rich brown or sparkling white. Similar to G.R. — **11c** each. Per dozen..... **$1.10**
ROYAL Microphone Transformers. A quality transformer carefully designed to assure faithful reproduction of voice and music for all purposes. Primary impedance of 100 or 200 ohms. For single button mikes — **$2.25**. Double button..... **$3.85**
BRISTOL MICROPHONE TRANSFORMERS. Made by the Bristol Talking Picture Co. For double and single button mikes. This is a *real* mike transformer. (Not an old telephone induction coil). Every one perfect. Our Special Price... **$1.95**
RCA Push-Pull Input-Output transformer. Metal-cased... **$1.65**

PARCON TRANSMITTING FILTER CONDENSERS

Metal-cased with stand-off insulators. Fully guaranteed!

Working Voltage	1 Mfd.	2 Mfd.	4 Mfd.
1000 Volts DC	**$1.20**	**$1.85**	**$3.10**
1500 Volts DC	**1.85**	**3.00**	**5.60**
2000 Volts DC	**2.85**	**5.25**	**8.35**

First time at these new low prices. *Order Now!*
RCA metal-cased 1 Mfd., 1000-volt condensers..... 65c
POLYMET 8 Mfd., Electrolytic condensers..... **$1.05**
FARADON 2 Mfd., 1100-volt working. Cased..... **$1.35**
TUNGSOL metal-cased. 2, 2, and 2 Mfd., 1250-volt..... **$3.95**
1 Mfd. 1500 V. and 2 Mfd., 1000-volt..... **$2.95**
DUBILIER .002 Mfd., 6000-volt WORKING. Mica..... **$1.75**
AEROVOX 2500 V. (test) .002 — **90c**. .001, .005, .00025, .0001 — **75c**. 5000 Volt: .002, .001, .005 — **$1.09**. .00025, .0001 — **94c**

WIRE WOUND TRANSMITTING GRID LEAKS

WARD-LEONARD 10,000 Ohm 6" long — **65c**. CT 4"..... 45c
RCA 5000 Ohm, 50 W. — **39c**. Electrad 50,000, 25 Watt... 82c
ELECTRAD 50,000 Ohm, 45 MA Bleeder. Mounted..... **$3.20**
CARDWELL 3000 volt transmitting .00044 or .00033 — **$6.37**
Lowest prices on all other Cardwell Condensers.
Enameled Aerial Wire. No. 12 — **70c** per 100 feet. No. 14.. **50c**
H & H Single pole, triple throw snap switches. 500 Watt... 35c
DeJur 2 Amp Rheostats — **22c**. Bakelite 4" Dials..... 20c

ROYAL DUSTPROOF PLUG-IN CRYSTAL HOLDERS

Very neat holder. G.R. plugs. Two for **$4.75**. Each..... **$2.45**
Imported French Headphone Sets. 4000 ohms..... **$1.25**
Highest Quality TUBES. *Free 15-day replacement.* UX-281, **$1.45**. 210, 250 — **$1.95**. 280, 245, 171-A, 112-A, 227, 226..... 65c
RCA No. 80 Super-het intermediate transformers..... 25c
Centralab 25,000 or 50,000 Ohm Potentiometers..... 45c

FREE Send NOW for our new BARGAIN BULLETIN

Because of the high cost of handling, we cannot accept orders under $2.50. Deposit required

HARRISON RADIO CO.

189 Franklin Street **Dept. T** **New York City**

French Report

By Jean Denimal, DX Traffic Mgr. R.E.F.

With the advent of improved propagation conditions a greater activity has been maintained by French stations, resulting this month principally in the making of numerous DX QSO's.

F8HA on 7-mc. works W regularly, as does F8FB, who has also worked HC1FG and VK3XI. F8TG works the world, in addition to being QSO W1CH and W1AXA on 7-mc. phone. Ex-F8LGB worked DX on 14- and 7-mc. as well as W1BEZ on 3.5-mc. F8PZ also works all over the world, while F8BJ with 50 watts c.c. does the same on 14-mc. Many of the French amateurs, by the way, either use or are installing crystal control.

F8CS is continuing to organize tests on 7-mc. with YS1FM in Salvador. Amateurs hearing this station are requested to report to F8CS or Mr. Alfredo Mejia, Legation of Salvador, 12 Rue Gallilée, Paris, 16eme.

Other DX stations deserving mention are: F8EO, F8EJ, and F8EX. F8PZ accomplished the rather unusual feat of working LZ5UB, Bulgaria. Our friend, F8RJ, advises of his impending departure for Algiers, where he is erecting a portable station for the occasion in order to keep in touch with his friends. We wish our comrade good luck, and are in hope of many QSO's with him.

—- - - —

New Zealand Report

By D. Wilkinson, Vice-Pres. N.Z.A.R.T.

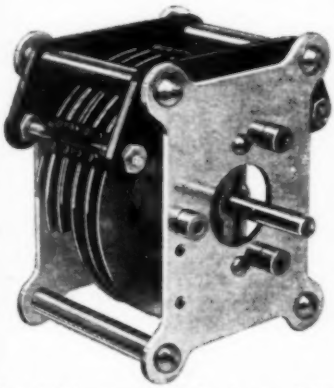
At the annual election Wellington, N. Z., was again voted to be Headquarters of the Association. The chief officers for the year are: President, H. P. V. Brown, ZL3CG; Vice-president and Chairman of Executive Committee, D. Wilkinson, ZL2AB; General Secretary and Communications Supervisor, W. Ashbridge, ZL2GP; Treasurer, S. H. Perry, ZL2BC. The official address of the N.Z.A.R.T. is Box 489, Wellington, N. Z. Total membership is now nearly 300.

Chief activities during the past two months have been centered in the 7- and 3.5-mc. bands. This year 14-mc. has proved itself very unreliable in New Zealand for DX, and as a result nothing has been done on the 28-mc. band.

The B.E.R.U. tests in February were not an outstanding success for ZL's as conditions here were anything but what we had hoped for. Only a very few stations were able to forward score-sheets on the test, which were practically confined to the 14-mc. band on account of the QRM and congestion on 7-mc.

On the other hand the 7-mc. band has been excellent, European stations and in fact all continents coming through with good regularity and volume, both in early evening and early morning. Our greatest thrill, however, has been on the 3.5-mc. band where a great many contacts have been made with U. S. A. stations by even low-powered ZL's, some of whom have not previously worked DX. The old "80-meter" band

GET RID OF HAND CAPACITANCE IN YOUR FREQUENCY METER



TYPE 556 Amateur-Band Condenser $3.50

HAND capacitance and other stray effects which ruin the accuracy of your dynatron frequency meter will be practically eliminated after you install the new General Radio band-type condenser. The solid (360°) rotor plates take care of hand capacitance, the large zero capacitance minimizes the influence of strays.

Write for complete specifications of this and other General Radio amateur apparatus: sockets, rheostats, dials, insulators, transmitting condensers, wavemeters, etc. Ask for Bulletin 933-Q1.

GENERAL RADIO COMPANY

CAMBRIDGE A, MASSACHUSETTS

PACIFIC COAST WAREHOUSE: 274 BRANNAN STREET, SAN FRANCISCO

P A C E N T

Duo Lateral

C O I L S

Radio engineers and laboratories with real records of accomplishment use Pacent Duo Lateral Coils. They come in all standard turn ratios.

Write for information and prices

PACENT ELECTRIC CO., INC.
91 SEVENTH AVENUE, NEW YORK CITY

The NEW 1931

Trouble Shooter's MANUAL

by

John F. Rider

With the FREE Question and Answer Service

More than 950 pages! More than 1800 diagrams, illustrations, &c.

This is the *most complete book ever offered* to the radio service men. Nothing has been left undone to furnish every bit of radio service information which may be of value to the radio service man.

The wiring diagrams are complete with socket layouts, set analyzer, voltage data, electrical constants, color code, chassis layout. . . . Commercial broadcast receivers, short wave receivers and adaptors, kit receivers, midget receivers, set analyzers, public address systems, power amplifiers, power packs, tube data, *a complete* Radio Service Course in Trouble Shooting, principles and application of the set analyzer, a separate section devoted to the peculiarities in radio receivers.

Complete!!! Complete!!! COMPLETE!!!!!! Modern up-to-date in every respect. Hot off the press! If you do service work you must have this book. It is sold with a money back guarantee. . . . One successful repair job pays for the cost of the book.

More than **950** *pages and more than* **1800** *diagrams, illustrations, &c.*

Price $5.00 Postpaid
$5.50 West of the Miss.
We will send the book C.O.D. if you want it so.
If you want more detailed information write for folder A.

RADIO TREATISE CO., INC.
1440 Broadway **New York City**

POWERTYPE CRYSTALS

For Amateurs, Commercial Stations and Dealers

THE STANDARD OF COMPARISON

POWERTYPE crystals are recognized as the best.

No off frequency operation with

POWERTYPE CRYSTALS

FULLY GUARANTEED BY A RELIABLE COMPANY

Ground by experts and calibrated from precision standards. Crystals for amateurs ground to approximate frequency and calibrated to better than 1/10 of 1%.

1715–2000 kilocycle band	$10.00
3500–4000 kilocycle band	12.50
7000–7300 kilocycle band	20.00
One inch oscillating blanks	4.00
Plug-in dust proof mounting as illustrated above	6.00
Twelve inch minus 10 to plus 110 degrees Centigrade thermometers	3.00

Grinding instructions furnished with crystal blanks.

550–1500 kilocycle band — calibrated at any temperature plus or minus 500 cycles desired frequency complete with plug-in dust proof mounting — $45.00. Constant temperature heater oven less crystals $150.00.

We do any kind of special crystal grinding for any frequency.

TO THE AMATEUR

It is important that amateurs stay within the limits of their assigned frequencies. Operate with the knowledge and assurance of being on the frequency you claim to be. The only sure way is crystal control. Our calibration is not guesswork, but is made with laboratory precision instruments. Consider these things when buying a crystal — they are important! Many amateurs have found this out too late.

BUY A CRYSTAL WITH A GUARANTEE

You may order direct from this ad C.O.D.

FREE Send name, no obligation, for full information on crystals, holders, blanks, heater ovens, etc.

"CLEAR AS A CRYSTAL"

AMERICAN PIEZO SUPPLY COMPANY

1101 Huron Building Kansas City, Kansas

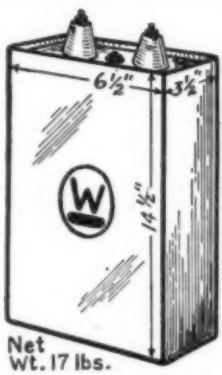
Specialists in frequency precision

Consult us on your problems.
Our Engineering Dept. is at your disposal.

Last Call!

Act quickly to get these *Westinghouse* oil filled filter condensers at far below actual value. The only chance you ever had, and perhaps ever will have.

Rated at 1 mfd. 3500 volts DC, plus 10% allowable ripple voltage. The highest type of condenser construction — insuring against breakdowns.



List Price $58.00

While they last, our price, lots of ten $18.00 ea. net; lots of four $20.00 ea.; less than four $23.20 ea.

Special quantity prices to manufacturers, but you *must* act promptly.

Send 10c for our complete catalog

E. F. Johnson Co., Waseca, Minn.

has always been very popular in New Zealand, as it is the beginner's band and all new hams are compelled to break in their stations and their operating abilities on this band before being permitted on the higher frequencies. Now some of these new hams are working real DX with 30 or 40 watts input. The climax was reached on February 28th, when ZL2BE was QSO G6RB in England at 0700 G.C.T. This surely means the return of 1923 conditions very soon. Heartiest congratulations to both ZL2BE and G6RB.

During the month of February the Hawke's Bay district of New Zealand was stricken by a disastrous earthquake, completely wrecking the towns in the area and causing severe loss of life. All means of communication with the area were destroyed and until these were restored, AL2GE of Napier, ZL2BE of Hastings, and ZL2FC of Wairoa filled the breach admirably and handled thousands of words of traffic (mostly official) day and night without a break.

It was a very fine performance and we very warmly congratulate these stations for their untiring work under the most difficult of conditions. They made a great name for the N.Z.A.R.T. and brought the value of the Association before the general public as it has never before been done.

South African Report

By Dr. S. H. Walters, S.A.R.R.L. Correspondent

The S.A.R.R.L. notes have been conspicuous by their absence from these pages for so long that it is highly necessary that we once more figure in the I.A.R.U. columns.

The impending conference at Cape Town during Easter is likely to have a very important bearing on the future of the League. Several momentous decisions will be made. Constitutional matters loom large, but it is also a big occasion for confirming aerial acquaintances and renewing others.

The HOS Trophy has just been competed for on 7-mc. and must be considered a big success. 28-mc. has not been successful, and the Empire competition was not productive of a single DX contact here. For that matter, 14-mc. was not very much better. Average conditions were relatively poor.

Crystal control is taking on to a very marked degree, following the leads of ZS1P, ZT1J, and ZU6K. Southern Rhodesia has been allotted the call ZE instead of VP.

A definite ruling on phone has been given by our HQ, which provides for free use of it on 3.5-mc.; restricted use during the popular half hour on 7-mc.; and none at all on 14-mc. except by very special permission of the headquarters.

South African amateurs are complaining of poor QSL'ing on the part of W stations.

In presenting the list of WAC Club members admitted during 1930 by the I.A.R.U. which appeared in March *QST*, we were of necessity forced to refrain from listing those certificate owners whose memberships were granted during the brief interim between the end of 1929 and the

E. H. RIETZKE, President

First Instructor at Bellevue (NKF). Three and one-half years Instructor in Charge of the Navy's advanced course for Chief and First Class Radiomen at the Naval Research Laboratory, Bellevue, D. C. Developed for the Navy what is recognized as the finest residence course in advanced radio for the experienced radiomen in the country. In radio since 1913.

IF

You are an experienced radioman;

You are ambitious to get ahead rapidly in radio;

You realize the necessity of a directed training in the engineering principles of radio but are unable to take advantage of college training, —

Then—

send in the coupon for our new illustrated book, "Modern Radio." It will give you complete details of an advanced home study course in Practical Radio Engineering WRITTEN FOR THE EXPERIENCED RADIOMAN.

Capitol Radio Engineering Institute, Inc.
3166 Mt. Pleasant St., N.W., Washington, D. C.

Please send me, without obligation, your new 1931 issue of "Modern Radio" explaining your advanced course in Practical Radio Engineering.

Name.....

Address.....

Position.....

QST June '31

its Popularity DEMANDS a SECOND EDITION

New circuits and new refinements call for additional information incorporated in the NEW VOLUME CONTROL guide. Send 25c for the 2nd edition which shows how a mere handful of CENTRALAB volume controls enables you to service practically any old or new set.

Centralab

MAIL COUPON TO-DAY!

CENTRAL RADIO LAB.
929 Keefe Avenue, Milwaukee, Wisconsin
Here is 25c. Send me new VOLUME CONTROL GUIDE

Name.....

Address.....

City.....*State*.....Q.S.T.

Every Ham Needs
THIS!

SPECIAL Hookup Wire Assortment

25′—No. 18 Tinned Pushback
25′—No. 20 Stranded R. Covered
25′—No. 18 Stranded R. Covered
25′—No. 16 High Tension Cable

Colored Outer Braid
All Heavily Lacquered

Enough to Wire Up All Your Apparatus

$1.00 *Postpaid Anywhere*

Gavitt Mfg. Co., Brookfield, Mass.

SEE PAGE 77 THIS ISSUE

RECTOBULBS!

BUILT IN PROPORTION TO YOUR NEEDS

The R81, 750 Volts..... **$7.00**
The R3, 3000 Volts..... **$10.00**
The R4, Heavy Duty..... **$20.00**

When you hear a pretty note on the Air think of Rectobulbs.

We recondition your tubes at the following prices:

50 watt WE tubes..... **$15.00**
250 watt WE tubes..... **$35.00**
Thoriated 50 watters..... **$19.00**
Thoriated 250 watters..... **$60.00**
Thoriated 852 tube..... **$16.50**
Thoriated 860 tube..... **$19.00**
Thoriated 849 tube..... **$80.00**

We guarantee our work satisfactory

Try our N65 Screen grid in your Buffer stage: Sure FB. Price..... **$12.50**

NATIONAL RADIO TUBE CO.
3420 18th Street **San Francisco, Calif.**

Super Akra-Ohm Wire-Wound Resistors

are carefully designed to insure an accuracy of one per cent and a constant permanency of calibration.

They afford an inexpensive means to build test equipment for the measurement of resistance voltage and current with accuracy, and are sold by us either singly or in kits for those who desire to build their own

Capacity Bridge
Wheatstone Bridge
Multi-range A.C. and D.C. Voltmeters

We have prepared separate Bulletins fully describing the construction and use of the above circuits. If you will write us which ones you are interested in, we will gladly send copies without any obligation on your part.
Address Dept. C.

Shallcross Mfg. Company
ELECTRICAL SPECIALTIES
700 PARKER AVENUE
Collingdale, Pa.

taking over of the WAC Club in early 1930. These twenty-one in number, follow:

S. J. Mallery, W2CJX; Dr. J. R. Wortley-Talbot, G6WT; A. S. Andrews, VQ2BH; Prentiss Selby, ZU6N; J. P. Malan, ZS2N; Ronald Gordon, W6AAZ; George N. McNeil, W1RW; K. Kasahara, J3DD; Dr. G. H. Ryder, W1IA; Stanley Miller, W7PV; B. Edwards, W5AWD; W. H. Lucas, ZU6A; A. Ussher, ZS6Z; Cesar A. Pereira da Silva, CT1BR; Jan Ziembicki, SP3AR; A. E. Ayling, AC1BD; Henry A. Whitehead, W2EL; A. C. de Oliveira, CT3AA; Herbert John Buckley, ZS5U; Daniel Fritsch, W3CEE; G. Kruse, SM5TN; F. Theobald, AC3FR.

German Report

By Dr. Curt Lamm, *Foreign Sec'y D. A. S. D.*

DX conditions on 14 mc. seem to have improved a lot since last month. Not only do stations from all over North America come in well, but also a few Argentine and Chilean stations were to be heard and worked around midnight G.C.T. The best time for W QSO's on that band seems to be 1900 G.C.T. At about 0500-0700 VK and ZL stations are being heard very well over here. ZS and other South African stations were worked frequently from 1500–1700.

On 7 mc. W's are being heard well, as usual, from 2300 G.C.T. until early morning. An interesting phenomenon was observed by DE812 of Berlin. He states that the 1st and 2nd districts of the U. S. are heard best around 2200 G.C.T. while stations in the southeastern states (3rd and 4th Districts) come through well until midnight, and stations in the middle west down to Louisiana are at their best at about 0200. At that time W1's and 2's drop out completely, which clearly defines the line of skipped distance.

May we through this report request amateurs overseas to at least reply to reports received from German receiving stations? Our foreign friends must please realize that owing to the rather awkward license situation existing in this country most of our enthusiastic amateurs are confined to sending reception reports to other stations, and any foreign station that answers such reports helps to encourage the amateur spirit in this country. Thanks, OM's.

We hope to have seen many of our friends from abroad by the time this report is read, for at that time our Annual Convention at Hamburg will just be ending.

Making the Most of the Standard Frequency Transmissions

(*Continued from page 42*)

Standard Time, and W6XK, Pacific Standard Time. Schedule BB transmitted by W1XP is intended particularly for European amateurs and starts at 2100 G.C.T. Schedule BX is transmitted especially for amateurs in Oceania and the Far East. It is transmitted starting at 1200 G.C.T. by W6XK. Reports on these special schedules are particularly desired, not

QST Oscillating Crystals

"THE STANDARD OF COMPARISON"

AMATEUR BANDS:

How does YOUR signal compare with the accepted IDEAL signal? May we suggest our product to attain this IDEAL signal? HERE'S HOW:

One item of great importance is the *frequency stability* of your set. Does it *stay* on *one* frequency? If not, our *power crystals* will solve that problem. SCIENTIFIC RADIO SERVICE crystals are *known* to be the best obtainable, having ONE single frequency and highest output. With each crystal is furnished an accurate calibration guaranteed to *better than a tenth of* 1%. *New prices* for grinding *power crystals* in the *amateur bands* are as follows:

1715 to 2000 Kc band.....**$15.00** (unmounted)
3500 to 4000 Kc band.....**$20.00** (unmounted)
7000 to 7300 Kc band.....**$40.00** (unmounted)

BROADCAST BAND:

Power crystals ground in the 550–1500 Kc band accurate to plus or minus 500 cycles of your specified frequency fully mounted for $55.00. In ordering please specify type tube, plate voltage and operating temperature. All crystals absolutely guaranteed regards to output and frequency and delivery can be made within two days after receipt of your order.

CONSTANT TEMPERATURE HEATER UNITS:

We can supply heater units guaranteed to keep the temperature of the crystals constant to *better* than a tenth of 1 degree centigrade for $300.00. Two matched crystals, ground to your assigned frequency in the 550–1500 Kc band with the heater unit complete $410.00. More detailed description of this unit sent upon request.

ATTENTION AIRCRAFT AND COMMERCIAL RADIO CORPORATIONS:

We invite your inquiries regards your crystal needs for Radio use. We will be glad to quote special prices for POWER crystals in quantity lots. We have been grinding *power* crystals for over *seven years;* being *pioneers* in this specialized field, we feel we can be of real service to you. We can grind *power crystals* to your specified frequency accurate to plus or minus .03%. All crystals guaranteed and prompt deliveries can be made. *A trial will convince you.*

SCIENTIFIC RADIO SERVICE

"THE CRYSTAL SPECIALISTS"

P. O. Box 86 **Dept. P-13** **Mount Rainier, Maryland**

• *The* HY-7 Super-Het •

Is always up-to-date, whether for C.W., fone or SW broadcasting. Latest broadcast type uses the pentode tube, find out about it. Complete theoretical article telling why the short-wave super-het needs a strictly short-wave design for 10c. Strictly custom-built, the receiver can be made to suit your needs. Strictly custom-built it uses the latest tubes and worthwhile technical features at once. You want an up-to-date short-wave super — find out about the HY-7.

AMATEUR HEADQUARTERS — Gavitt mikes, double-button or hand-mike; Gavitt mike stands, transformers and shielded cords. Pilot, Yaxley, Aerovox parts. Also National, Cardwell, Durham, Insuline, Flechtheim, Electrad, Perryman, Weston, Jewell, Dayrad, Beede, Readrite, Hammarlund, Clarostat, Thordarson, Siemens-Halske, and Corwico. Solder, lugs, soldering coppers, copper tubing, etc. *Order it, we have it at amateur prices.*

HATRY & YOUNG, Inc., Hartford, Conn.
119 Ann Street *'Phone 5-2733*

Learn TELEVISION *and* RADIO
THE RESIDENTIAL WAY

The demand for "trained men" in Television and Radio is constantly increasing. Your future depends on CORRECT TRAINING. Here you'll enjoy the study of Theory and Practice, *the residential way,* in all branches of Radio. Modern equipment, and specialized instructors, for Servicing, Operating and Engineering. Special rate to licensed amateurs wishing to secure commercial ticket. *Write for new catalog describing Courses and what this Institute means for your success in Radio.*

THE CHICAGO RADIO INSTITUTE
DePaul University Building **Chicago, Illinois**

Sending Is *EASY*

With the *Easy-Working Genuine Martin No. 6*

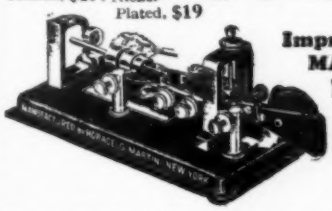
New VIBROPLEX

Reg. Trade Marks: Vibroplex; Bug; Lightning Bug

The smoothest, easiest-working bug on the market. Easy to learn. Easy to operate. Makes sending easy.

In Colors *Blue Green Red*

Black or Colored, **$17.** Nickel-Plated, **$19**



Improved MARTIN Vibroplex

Black or Colored, **$17**
Nickel-Plated, **$19**

Special Martin Radio Bug — Extra large, Specially Constructed Contact Points for direct use without relay. Black or Colored. **$25**

Old Vibroplex accepted as part payment
Remit by Money Order or Registered Mail

THE VIBROPLEX COMPANY, Inc.
825 Broadway, New York City
Cable Address: "VIBROPLEX" New York

Type 866

MERCURY VAPOR RECTIFIER

$5.00

Filament Voltage	2.5 Volts
Filament Current	5 Amperes
Max. Peak Voltage	5000 Volts
Max. Peak Current	.6 Amperes

Type 872

MERCURY VAPOR RECTIFIER

$14.00

ALL TUBES FULLY GUARANTEED

NEON GLOW STICKS $2.50

POWER TUBES REPAIRED

CANATSEY NEON TUBE CO.

512-14-16 Wyandotte St.

KANSAS CITY, MISSOURI

Massachusetts Radio and Telegraph School

18 Boylston Street, Boston

Send for Catalogue

Tel. Hancock 8184 ***Established 1905***

JACOBS ANTENNA SPREADER

Patented Sept. 8, 1925; Sept. 7, 1926

Made of metal in 2½", 5", and 7" diameters

For the efficient construction of cage antenna or counterpoise. Being used by transmitting amateurs, broadcast stations, experimenters and technicians.

Price $10.00 per dozen; $6.00 for a half dozen

CHARLES F. JACOBS (W2EM)

279 Park Place Brooklyn, N. Y.

All You Need to Learn TELEGRAPHY

Morse or Continental

with **Teleplex**

Learn Telegraphy — the world's most fascinating profession — by *hearing* real messages — *sending* them. Interesting — simple — you learn quickly — at HOME.

Teleplex is the Master Teacher. Used by U. S. Army, Navy and leading radio and telegraph schools. *Write for Folder Q-6.*

TELEPLEX COMPANY

76 Cortlandt Street, New York

only from overseas hams but from those in the Americas.

Although the frequencies of the transmitting stations are not guaranteed as to accuracy, every effort is made to keep to within 0.01% of the announced frequencies. The frequency standards are calibrated against the National Frequency Standard. Frequent checks on the transmissions are made by laboratories equipped with accurate frequency standards and the transmissions are also checked by the U. S. Department of Commerce monitoring stations.

TRANSMITTING PROCEDURE

The time allotted to each transmission is 8 minutes, divided as follows:

2 minutes — QST QST QST de (station call letters).

3 minutes — Characteristic letter of station frequency by call letters and statement of frequency. Characteristic letter of W1XP is "G," of W9XAN is "D," and of W6XK is "F."

1 minute — Statement of frequency in kilocycles and announcement of next frequency.

2 minutes — Time allowed to change to next frequency.

THE TRANSMITTING STATIONS

W1XP: Massachusetts Institute of Technology, Round Hill Research, South Dartmouth, Mass., Howard A. Chinn in charge.

W9XAN: Elgin Observatory, Elgin National Watch Company, Elgin, Ill., Frank D. Urie in charge.

W6XK: Don Lee Broadcasting System, Los Angeles, Calif., Harold Peery in charge.

REPORTS

Handy blanks for recording and reporting the transmissions can be had for the asking. Just drop a card or send a message to Hq. asking for s.f. report blanks and they will be sent postpaid. When you receive a transmission be sure to send in a report addressed to the A.R.R.L. Standard Frequency System, *QST*, West Hartford, Conn. After a record of the report has been made at this office it will be forwarded to the proper transmitting station.

5000-KC. BUREAU OF STANDARDS SIGNALS

Standard frequency signals of 5000-kc. frequency, accurate to within one part in a million, will be transmitted by the Bureau of Standards Station, WWV, on the following Tuesdays: June 2nd, 9th, 16th and 30th. The transmissions will occupy two-hour periods during the afternoon and evening of each of the above dates, the hours being from 1:30 to 3:30 p.m. and from 8:00 to 10:00 p.m., E.S.T. More complete details of this service will be found on page 39 of January *QST*. These signals are particularly useful for calibrating piezo sub-standards, etc. Reports on WWV transmissions may be forwarded to the Bureau of Standards direct or via A.R.R.L., West Hartford, Conn.

— *J. J. L.*

HERE'S A RARE OPPORTUNITY TO COMPLETE YOUR QST FILES

Space doesn't permit us to mention complete constructional and technical information to be found in these issues, but let's take a peek at some of the 1929-1930 articles: the high-frequency superhet for 'phone reception; modern radio telephone design; how to build a 'phone transmitter at low cost; a simple 1750-3500-kc. receiver for beginners; the single-control transmitter; A.C. high-frequency receivers; new ideas in high-frequency transmitter construction; using your broadcast receiver for short-wave reception; the dynatron frequency meter; complete transmitter with tubes and power supply for $45; a two-tube a.c. receiver — and many more!

Future issues of QST, too, will be of greater value to you if you have these copies for their back-issue references.

All 1925 copies (except January, May and July)	$2.50
All 1926 copies — complete	$2.50
All 1927 copies (except January)	$2.50
All 1928 copies (except January, February and August)	$2.50
All 1929 copies — complete	$2.50
All 1930 copies — complete	$2.50

All six years for $10.00, a saving of $5.00, if all six years are ordered complete. Individual yearly sets are $2.50 each. Single copies 25c each.

ALL QUOTATIONS INCLUDE POSTAGE

Binders to keep these files in order are $1.50 each, postpaid

Each binder holds 12 issues of QST and does not mutilate the copies

AMERICAN RADIO RELAY LEAGUE

38 LaSalle Road + West Hartford, Conn.

SIXTY-FIVE BACK COPIES OF QST FOR TEN DOLLARS, postpaid

SIX YEARS OF QST BACK COPIES, NEARLY COMPLETE, WITH INDEX

ACME
WIRE PRODUCTS

Coils, Magnet Wire Wound
Aerial Wire — Stranded and Solid
Varnished Insulations
Parvolt Filter and By-Pass Condensers

All products made to Recognized Commercial Standards including those of:
National Electric Mfrs. Assn.
Radio Manufacturers Assn.
American Society for Testing Materials

For more than 25 years manufacturers and suppliers to the largest and most discriminating users.

THE ACME WIRE CO.
NEW HAVEN, CONN.

Branch Offices:

New York — 52 Vanderbilt Ave.
Cleveland — Guardian Bldg.
Chicago — 842 N. Michigan Ave.
Rochester, N. Y. — 135 Spring Street

▲ ▲ ▲ BARGAINS ▲ ▲ ▲

Tested and functioning, U.X. 210	$1.20
Used Western Electric 211-D or D tubes	10.00
New Western Electric 211-E or D tubes	17.50
Teleplex with four tapes used	13.50
R.C.A. U.V.-211 new	22.00

Wanted: 212D W. E. tubes. Gud condition only.

UNCLE DAVE'S RADIO SHACK
115 N. Pearl St. *Phone 4-5746* **Albany, New York**

ALUMINUM BOX SHIELDS

Western Electric 21 AA 750v-1 Mfd Parvolt 800v 1-2 Mfd 65c each

Genuine "ALCOA" stock, silverdip finish, 5 x 9 x 6, $1.89 — 14 x 6 x 6, $3.85. 10 x 6 x 7 Monitor size $3.25. 4 x 4 x 5 Coil Shield (like picture on left) $1.00.

ANY SIZE TO ORDER
Coil Shields, Coil Hole Covers, Shielded Wire.
National Equitune 500 mmf. Cond.
Reg. Price $5. Special $1.50.
1000 Cycle Buzzer.....50c
Please include Postage.

BLAN, the Radio Man, Inc.
89 Cortlandt Street, Box Q. 6, New York City

HILET

Attenuator network, T system, 60 db in 3 db steps, 500 ohm line, units **$27.50**. Other sizes to order. **FILAMENT TRANSFORMERS** — 5000 volt ins. 100 watt **$5.50**, 150 watt, **$6.50**, 250 watt, **$8.00**, 500 watt, **$13.00**, 750 watt, **$18.00**, 1000 watt, **$26.00 PLATE TRANSFORMERS** — 1500 each side 300 MA, **$19.50**. 1500–1000 each side 200 MA, **$15.00**, 1000–750–500 each side, 160 MA, **$10.50**, 1 KVA, **$26.75**, 1½ KVA, **$34.50**, 2 KVA, **$42.00**, 2½ KVA, **$54.00**, 3 KVA, **$69.00**. **CHOKES** — (See our May ad.) Special transformers, chokes and resistors. Five-day delivery. Stock articles ONE day shipments.

Write for details

HILET ENGINEERING CO., ORANGE, N. J.

Calls Heard

(Continued from page 61)

w4fq w4fr w4ft .w4mk w4oi w4sy w4vp w4wb w4zf w5aby w5aca w5aeb w5akp w5arb w5avf w5axu w5ba w5bcb w5bnr w5bqm w5bst w5dn w5ee w5qf w5ha w5hj w5kw w5ob w5oe w5ow w5qy w5rv w5wf w5yg w6acp w6acv w6akf w6am w6aoj w6apg w6apz w6aut w6awa w6axw w6bax w6bet w6bqk w6bse 6buy w6bvz w6cct w6cdv w6ceo w6cug w6cvz w6cya w6can w6dcj w6dkw w6dtd w6dyn w6dzx w6ebo w6efq w6ehp w6ein w6eja w6ew w6ewk w6faa w6fav w6fci w6ffe w6he w6in w7arz w7asg w7asz w7atw w7awl w7awo w7fu w7fv w7lp w7py w7wg w8aac w8aem w8afz w8agk w8ahn w8akw w8aky w8aqm w8apt w8ayu w8baw w8bax w8bjt w8bk w8bny w8bzd w8bys w8bzb w8cep w8cft w8cif w8ciy w8cpz w8dfe w8dfh w8duw w8dvi w8eik w8eoh w8kj w8sh w8ww w9aa w9ace w9afz w9ahx w9aid w9ajo w9am w9anr w9aog w9aqt w9aqz w9asi w9asv w9atf w9bfi wlbfl w9bgd w9bmw w9bnh w9btd w9btv w9bxi w9byl w9cgc w9cks w9eno w9cpi w9crj w9cu w8dfh w9do w9doq w9drq w9dvh w9dyx w9dzu w9eis w9ekm w9ekq w9erz w9eul w9exn w9eyc w9fay w9fio w9fru w9fvw w9fwu w9fyk w9gbj w9gef w9gop w9gag w9gsh w9gwb w9io w9jf w9jp w9kd w9kw w9lf w9ob w9sv w9ue w9um w9vm w9yl

W9BVI, Elk River, Minn.

14,000-kc. band

ac2bx b7x ce1ai ce3cr em1fm em2ay em2cf em2sh em8uf em8yb et1bx ex2bt d4awo ear96 ear185 f3mta f8ex f8pa g2by g2cj g2dh g2rh g2vq g5bj g5by g5is g5me g5ml g5qu g5vm g5yg g5yk g6dp g6lk g6qd g6rb g6wt g6wy helfg k4bpf k4kd k6bvp k6ccs k6erh k7mn lu1ba lu1cz luldy lu2ca lu3fa nj2pa nl3mta oa4i oa4q oa4y oa4z oh2ow ok2ag on4fp on4uu ppx2 py2az py2ba py2bn py7aa py8ia ti2fg ti3xa vk2dy vk2hc vk2lo vk3hk vzx4x v1yb xu5wa xw2ll z3a yv3lo zl1ar zl2ac zl2gw zl3as

W8CYK, Nelson P. Cramer, 3543 Raymar Blvd., Cincinnati, Ohio

700-kc. band

em1mn em1oe em1by em2ap em2cf em2jm em2sh em2rz em2xa k6ccs k6ddm k7ann k7wb k7wm oa4v oa4z ts4nac vc1as ve2co ve4ja ve5bc w6be w6byb w6byl w6dai w6dkw w6dtz w6egh w6ehy w6ezu w6fbc w6fcf w6hy w6sf w7ajm w7eo w7nm w7op w7zf x9a

14,000-kc. band

au9a em2sh em2rz em2ac ear98 ear116 f3mta f8fem f8why f8rd f8re g2vq helfg on4caa on4dj on4ee py2aa py2bf py2bo oa4x oa4z rx1aa velam velau ve2ap ve2bo ve2co ve4dk ve4fx ve4ic ve4ve ve5cf vo8z vo8f x2biz x9a

W4EG, N. M. Patterson, 2804 Hillsboro St., Raleigh, N. H.

bo8 et1bx et1cw et2af en8eis d4aif d4nnu ehi ear7 ear16 ear94 ear98 ear195 f8kb f8pq f8tq g2ol g5by g6gx g6lk g6xn haf3d haf6b haf8e hb9p hb9q helfg hl4hz k6ed k6exh on4ka on4bx on4dj on4hv on4hc on4pr pa0ld pa0ql pa0xg ajya uo1js uo2js ve5cr ve5dx v1ja vn2bg vo8z vzx4x vk3es vk3ka vu2af xf7c

W4FD, J. B. Epperson, and N. S. Hurley, P. O. Box 972, Knoxville, Tenn.

7000-kc. band

ac2ay ce1ah ce3de em8by haf3d ka8aa k4rj k6erh lu2ca ve1al ve2br ve3bq ve3cm ve4ag ve4ba ve4cv ve4dy ve5cu ve5fi ve2dy vk3le vk3ml vk3nm vk3wl vk4rg vk5hg vk5mf vk5xk vk6mo vk6mi x1g x5c x9a zl1fv zl2bz zl3cc v1js vzx4x zs2z

14,000-kc. band

et1an g6wy oa4z py7aa ti3xa ve1as ve1dr ve2bo ve3ha ve3xc ve4ai ve4bj ve4bq ve4cv ve4dk ve4ec ve4hd ve4is ve5fi x9a xw1b zs4m

Guaranteed New Radio Bargains

Auto Radio — Uses 3-224, 2-227 tubes and 1-245 Power tube, single dial, tremendous volume. Compact. Fits any car. We guarantee this set to pull in stations within a radius of 1000 miles and that it will deliver the volume and tone qualities of an Electric set, or your money refunded **$20.00**

International Microphone — Two button for public address, systems and transmitters. Speech or music **$9.75**

Complete Phone and CW Transmitter 15 to 30 Watts, **$39.50** Including tuned plate, tuned grid oscillator with provision for crystal control. Wired for one or two UX 210 tubes. One or two UX 250's as modulators, two stages of speech amplification. Mounted in beautiful two-tone Walnut cabinet. Has ample space for AC power supply. Price includes one Stromberg-Carlson microphone.

Power Supply Unit for 15 to 30 Watt Transmitter **$19.75.** Will deliver 600 volt 150 milliamperes for plate current. Has filament for 281, 210, 250, 277, and 226 tubes.

World Wide 2-Tube Short Wave Receiver. $11.75. A two-tube receiver in a beautiful shielded metal cabinet. An ideal all around set which will give loud speaker reception on many stations. Very flexible in tuning. Complete with a set of 6 clip-in coils. Covers 14 to 550 meters. Can be used with any standard base tubes.

Tubes UX Type, 30 day replacement guarantee, No. 210, **$2.25**; No. 250, **$2.35**; No. 281, **$1.85**; No. 280, **95c**; No. 245, **$1.25**; No. 224, **$1.25**; No. 227, **75c**; No. 226, **65c**; No. 171, **75c.**

Low Power Transmitter, adaptable for phone or code. With plug-in Coils **$14.75**

Short Wave Sets, one tube complete with 5 coils, 14 to 550 meters **$6.45**

Stromberg-Carlson telephone transmitter on desk stand, **$2.75**
B Eliminator, Dry. 180 volts, will operate up to 10-tube set, with 280 tube, fully guaranteed **$6.75**

AC-A. B. C. Power Packs, completely assembled **$8.75**
250 V. B. also has A. C. filament for up to 9-tube set. Can be used as B eliminator. Make your battery set all electric, or build your A. C. set around this pack. 280 tube for this pack, 95c extra.

ORDERS SHIPPED PROMPTLY

CHAS. HOODWIN CO.

4240 Lincoln Ave. Dept. F. 8 Chicago, Illinois

MISTER HAM

You Want a Transmitting Condenser You Can Rely On

HERE IT IS!

Ask Exacting Engineers the World Over

Siemens and Halske have been making condensers since 1888. Their experience and integrity are built into these condensers.

Especially note our very generous ratings. These mean long life and insurance against breakdown.

OPERATING VOLTAGE—1000 VOLTS DC TEST VOLTAGE — 3000 VOLTS DC

Mfds.	Size	
1	2½ — 1¾	— 2¼
2	6 — 1¾	— 2¼
4	4¾ — 2	— 6

OPERATING VOLTAGE—2000 VOLTS DC TEST VOLTAGE — 6000 VOLTS DC

Mfds.	Size	
1	4¾ — 1	— 6
2	4¾ — 2	— 6
4	4¾ — 4	— 6

OPERATING VOLTAGE—1500 VOLTS DC TEST VOLTAGE — 4000 VOLTS DC

Mfds.	Size	
1	6 — 1¾	— 2¼
2	4¾ — 2	— 6
4	4¾ — 4	— 6

OPERATING VOLTAGE—3000 VOLTS DC TEST VOLTAGE—10,000 VOLTS DC

Mfds.	Size	
1	4¾ — 4	— 6
2	4¾ — 8	— 6
4	9½ — 8	— 6

INSIST ON SIEMENS

At Your Dealers—Or Write to

MORRILL AND MORRILL Sole U. S. A. Distributors

30 Church Street, New York City

SIEMENS' TRANSMITTING CONDENSERS USED THE WORLD OVER

$16.67 to AMATEURS

ELLIS Model 10N *TWO-BUTTON* Microphone will improve your transmission at least 100%. Write for details explaining why this TWO-BUTTON Microphone eliminates distortion. Special price to amateurs $16.67 and — *your money back if not satisfied.*

Export: Simons, 25 Warren St., N. Y.
Cable: "Simontrice"

ELLIS ELECTRICAL LABORATORY

337 WEST MADISON ST. Sales Corporation CHICAGO, ILLINOIS

Help For the RADIO MAN

ELECTRAD Resistors, Voltage Controls, Amplifiers and Sound Systems are used and praised by experts throughout the world. The products of long experience — highly perfected and moderately priced.

Write Dept. Q-6 for complete, new 36-page catalog

175 Varick St., New York, N.Y.

ELECTRAD INC.

... Fill in attached coupon for details

PORT ARTHUR COLLEGE

PORT ARTHUR (world-known port) TEXAS

PAC

U. S. GOVERNMENT ACCREDITED TRAINING SCHOOL

LEARN RADIO — *Travel the Seven Seas*

Good Pay • Adventure • Leisure for Study

Port Arthur College, Port Arthur, Texas
Please send details concerning Radio Course to

Name .....

Street or Box .....

City and State .....

AMATEURS IN CANADA!

Obtain lowest prices in Canada. We have a complete line of TRANSMITTING & RECEIVING EQUIPMENT.

REL

Radio Engineering Labs, Inc.
Spaulding · Bakelite
Esco Generators
Pyrex Insulators
Jewell Meters
Ward Leonard
and others

WRITE FOR LITERATURE

CHARLES J. BODNAR
641 BARRINGTON STREET
HALIFAX, N. S., CANADA

W8DYH, K. F. Conroy, 7553 E. Robinwood Ave., Detroit, Mich.

3.5-mc. band

ve5bl w6aan w6aau w6aix w6akw w6alu w6ayf w6bbo w6bdd w6bdx w6bfe w6blp w6bmh w6bna w6bp w6brv w6bua w6bvj w6cgc w6cgp w6cig w6clp w6cnm w6ddm w6der w6dmi w6dwv w6dyk w6egj w6epj w6etj w6etm w6eu w6eyz w6fbu w6ffq w6fw w6fwr w6gf w6kd w6lw w6of w6uo w6uv w6wd w6wv w6zq w7aat w7acg w7ach w7afx w7aaib w7ans w7aoq w7aof w7aqz w7asq w7awd w7hx.

Using Pentode Tubes in the Low-Powered Transmitter

(*Continued from page 29*)

be disconnected simultaneously, as is actually done when this transmitter is keyed.

As for methods of keying, the most practical seem to be by keying in the filament return of the final amplifier. Keying also may be accomplished in the screen-grid lead or "C" bias of the final stage. Keying cannot be accomplished in the plate supply lead, however.

Automatic bias may be obtained by disconnecting the "C" bias battery and connecting the radio-frequency chokes to "ground" with resistors in series with the filament center tap leads in the positions marked "X" in Fig. 1. This method requires a separate filament winding for each stage. The resistor required for automatic bias of the intermediate amplifier is around 1000 ohms and for the final amplifier, around 500 ohms.

Using crystals within the limits of 3500 to 3650 kc. in the oscillator, the final amplifier may be operated between 7000 to 7300 kc. There is no reason why one or more additional doublers cannot be inserted, if desired, in order to get up to 14,000, or 28,000 kc. If higher power is desired, another push-pull stage can be added, using up to ¼-kilowatt tubes in push-pull. This low power set has been in operation for some time at W1BVL, the writer's amateur station. Very pleasing results have been obtained and the set has performed much better than the 50-watt t.g.t.p. transmitter formerly used.

Silent Keys

It is with deep regret that we record the passing of these amateurs:

A. B. Caldwell, Detroit, Mich.
Harold G. Campbell, Brookline, Mass.
Edward Cassel, AC2MG, ex-W9FLP, Cortland, Nebr.
Ernest Chisholm, Victoria, B. C.
Hugh M. Hossler, W8DIK, Chardon, Ohio
W. C. Martin, W8AIF, Beckley, W. Va.
Svende Kaaber, OZ5SK, Ringe, Denmark
C. W. Randall, VS3AB, Johore Baharu, Johore
John M. Sherman, W9AOD, Craigmore, Colo.
James Sides, ex-5UR, Dallas, Texas